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THE CURIOUS INCIDENT OF THE DOG THAT DIDN'T BARK AND ESTABLISHING CAUSE-AND- EFFECT IN CLASS ACTION SECURITIES LITIGATION[†]

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[†] Copyright 2012. Michael L. Hartzmark and H. Nejat Seyhun. All rights reserved. The authors wish to gratefully acknowledge the valuable comments and insights of Jeff Leibel of the Garden City Group, Ran Wei of Navigant Economics, David Tabak of NERA and Ivana Mrazova of University of Michigan. In *Silver Blaze*, by author Sir Arthur Conan Doyle, the following exchange takes place between Sherlock Holmes and Inspector Gregory, the Scotland Yard detective:

[Inspector Gregory] 'Is there any other point to which you would wish to draw my attention?'

[Sherlock Holmes] 'To the curious incident of the dog in the night-time.'

[Inspector Gregory] 'The dog did nothing in the night-time.'

[Sherlock Holmes] 'That was the curious incident,'

. . . .

[Sherlock Holmes] 'Before deciding that question I had grasped the significance of the silence of the dog, for one true inference invariably suggests others. The Simpson incident had shown me that a dog was kept in the stables, and yet, though someone had been in and had fetched out a horse, he had not barked enough to arouse the two lads in the loft. Obviously the midnight visitor was someone whom the dog knew well.'

SIR ARTHUR CONAN DOYLE, *Silver Blaze*, in *THE MEMOIRS OF SHERLOCK HOLMES* 1, 23, 27 (Oxford University Press ed., 1993) (1894).

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I. INTRODUCTION

THIS paper introduces an innovative tool, empirical test, and a new approach—what we call a reverse event study methodology—to help properly determine whether a security trades in an efficient market. Using our approach, the courts can properly evaluate whether “empirical facts show[] a cause-and-effect relationship between unexpected corporate events”¹ and disclosures to support a claim of fraud-on-the-market.

To establish whether the preponderance of evidence supports a conclusion that the security trades in an efficient market, parties frequently present courts with empirical analyses based on a naïve assumption that, “[t]heoretically, in a perfectly efficient market there should be no significant price movements without some identifiable news event”² or, conversely, that there should be significant price movements only with some identifiable news

1 Cammer v. Bloom, 711 F. Supp. 1264, 1287 (D.N.J. 1989), *appeal dismissed*, 993 F.2d 875 (3d Cir. 1993).

[I]t would be helpful to a plaintiff seeking to allege an efficient market to allege empirical facts showing a cause and effect relationship between unexpected corporate events or financial releases and an immediate response in the stock price. This, after all, is the essence of an efficient market and the foundation for the fraud on the market theory.

....

[O]ne of the most convincing ways to demonstrate [market] efficiency would be to illustrate, over time, a cause and effect relationship between company disclosures and resulting movements in stock price.

Id. at 1287, 1291. See also *In re Xcelera.com Sec. Litig.*, 430 F.3d 503, 511 (1st Cir. 2005); *In re SCOR Holding (Switz.) AG Litig.*, 537 F. Supp. 2d 556, 574 (S.D.N.Y. 2008) (citing Cammer, 711 F. Supp. at 1286–87); Krogman v. Sterritt, 202 F.R.D. 467, 477 (N.D. Tex. 2001) (“[I]n an efficient market, a stock’s price remains relatively stable in the absence of news, and changes very rapidly as the market receives new and unexpected information.”).

2 *In re DVI, Inc. Sec. Litig.*, 249 F.R.D. 196, 211–12 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011). See also Expert Report of Michael R. Gibbons at 66, *In re Enron Corp. Sec. Litig.*, No. H-01-3625 (S.D. Tex. Mar. 17, 2006). In his expert report on Enron, Professor Gibbons writes that Enron bonds traded in an inefficient market because:

[T]here were still 55 observations where the movement in the buy price of the Exemplar Registered Bond relative to the last buy transaction was in the opposite direction of the stock price movement in the same period and 20 observations where the movement in the Exemplar Registered Bond was inconsistent with both the stock price and the Merrill Lynch BBB Index.

Id.

event.³ In this paper, we argue that these assumptions are misleading, wrong, and need to be rejected. We show why, in an efficient market, it is expected that there will be some price movements with no disclosures, and conversely, why it is expected that there will be some material disclosures without price movements.

We demonstrate that the difficulties experts have in showing whether empirical facts support cause-and-effect in this context emanate from six primary sources. First, often there is an observed “effect” (price reaction) without an observed “cause” (disclosure) because there may be an unobserved change in the market’s expectations (i.e. the dog didn’t bark).⁴ Second, the statistical methods employed to evaluate systematic cause-and-effect relationships are imperfect, have limited explanatory power, and by their very nature are used to detect deviations from average activity. Third, there may be private trading activity—for example, insider trading or portfolio rebalancing—that is driving a price response without an observed cause. Fourth, there is often difficulty interpreting and assessing the relevance and materiality of a particular disclosure. The fifth difficulty is differentiating *ex ante* how the prices of different types of securities issued by the same company (e.g., stocks, bonds, preferred stock, etc.) will react to information. Finally, an improperly specified time period or expected speed of price response may lead to incorrect conclusions regarding the cause-and-effect relationship.

3 See *In re Scientific-Atlanta, Inc. Sec. Litig.*, 571 F. Supp. 2d 1315, 1339 (N.D. Ga. 2007) (footnote omitted).

Instead, Defendants take the position that Plaintiffs have failed to establish an efficient market for SA stock because “the price of [SA’s] stock did not move in a statistically significant positive way in response to the dissemination of any alleged misstatements identified in the Complaint.” (Br. in Opp’n to Mot. for Class Cert. [234] at 10.) In support of that position, Defendants rely on the affidavit of their expert, Dr. Cox, who conducted an “event study” which analyzed the effect of 20 allegedly fraudulent statements identified in the Complaint on the market price of SA stock. (Cox Aff. ¶¶ 10, 14-17.) According to Dr. Cox, the results of his event study did not show statistically significant positive stock price movement in response to these allegedly fraudulent statements. (*Id.* ¶ 17.) Based on these results, he opines that “[t]he Complaint’s efficiency claim is inconsistent with its allegations of material false and misleading statements.” (*Id.*)

4 In *Silver Blaze*, Sherlock Holmes used the fact that the dog didn’t bark to deduce the conclusion that the dog must have known the intruder. Sherlock Holmes did not conclude that the dog was behaving *inefficiently* on that day.

To surmount these challenges, courts must navigate numerous conceptual hurdles, while still paying attention to the specific features of the security at the center of the litigation and the structure of the market in which that security trades. Failure to adequately consider the characteristics of the security and its market can also lead to wrong decisions.⁵

Ultimately, wrong decisions raise significant issues of public policy. As described by the U.S. Supreme Court, private securities-fraud class actions are “an essential supplement to criminal prosecutions and civil enforcement actions”⁶ that “deter[] fraud”⁷ and “maintain public confidence in the marketplace.”⁸ Thus, any decision based on accepting or rejecting empirical tests or a rhetorical argument supporting cause-and-effect has much broader implications than simply preventing securities holders from having their day in court. In fact, such a decision may negatively affect a significant mechanism to deter fraud in the marketplace for all securities, thus raising the cost of capital to all issuers.

To address these issues, this paper is organized as follows. Part II provides a discussion of the legally established factors for determining the validity of a fraud on the market claim, their relation to the certification of securities class actions, and the elements of a claim of fraud on the market as relevant to claims of violations of the securities laws. Part III introduces the empirical methods generally used to evaluate cause-and-effect and the benchmarks used to evaluate whether the empirical analysis supports a claim of fraud on the market. Part IV continues with a discussion of the potential problems and weaknesses inherent with using the various empirical techniques described in Section III to evaluate the cause-and-effect *Cammer* factor. Part V builds on this with a discussion of our alternate empirical methods and analyses and provides a novel test for cause-and-effect, basically showing why “effect and cause” is the appropriate benchmark in securities litigation. Finally, in Part VI we summarize our conclusions.

5 A recent case-in-point is the *AIG* decision. *In re Am. Int’l Group, Inc. Sec. Litig.*, 265 F.R.D. 157, 176–80 (S.D.N.Y. 2010). See Michael Hartzmark, Cindy A. Schipani & H. Nejat Seyhun, *Fraud on the Market: Analysis of the Efficiency of the Corporate Bond Market*, 2011 COLUM. BUS. L. REV. 654 (2011).

6 *Tellabs, Inc. v. Makor Issues & Rights, Ltd.*, 551 U.S. 308, 313 (2007).

7 *Dura Pharm., Inc. v. Broudo*, 544 U.S. 336, 345 (2005).

8 *Id.*

II. CLASS CERTIFICATION IN SECURITY MARKETS

Rule 23 of the Federal Rules of Civil Procedure outlines the requirements for class certification.⁹ One of the critical elements required to certify any proposed class of security holders is that “questions of law or fact common to the members of the class predominate over any questions affecting only individual members.”¹⁰ According to the *Cordes* court, “[t]he predominance requirement is met if the plaintiff can ‘establish that the issues in the class action that are subject to generalized proof, and thus applicable to the class as a whole, . . . predominate over those issues that are subject only to individualized proof.’”¹¹

An important part of the analysis to determine whether the predominance requirement is met in securities litigation involves whether common issues of “reliance on the integrity of the price set by the market”¹² existed. In order to establish that common issues of reliance predominated, the Court has found it necessary for the lead plaintiffs to meet the requirements of the fraud on the market presumption¹³ as described by the U.S. Supreme Court in *Basic v. Levinson*.¹⁴ According to *Peil v. Speiser*:

The fraud on the market theory is based on the hypothesis that, in an open and developed securities market, the price of a company’s stock is determined by the available material information regarding the

⁹ FED. R. CIV. P. 23.

¹⁰ FED. R. CIV. P. 23(b)(3).

¹¹ *Cordes & Co. Fin. Servs. v. A.G. Edwards & Sons, Inc.*, 502 F.3d 91, 107–08 (2d Cir. 2007) (citing *In re Visa Check/Mastermoney Antitrust Litig. v. Visa, United States*, 280 F.3d 124, 136 (2d Cir. 2001)).

¹² *Basic Inc. v. Levinson*, 485 U.S. 224, 245 (1988).

¹³ *See id.* at 255 (“At the bottom of the Court’s conclusion that the fraud-on-the-market theory sustains a presumption of reliance is the assumption that individuals rely ‘on the integrity of the market price’ when buying or selling stock in ‘impersonal, well-developed market[s] for securities.’”).

As relevant here, courts have permitted a rebuttable presumption of reliance in the case of securities traded in “efficient markets” (i.e., markets which are so active and followed that material information disclosed by a company is expected to be reflected in the stock price). This substitute for actual reliance is commonly referred to as fraud on the market.

Cammer v. Bloom, 711 F. Supp. 1264, 1273 n.11 (D.N.J. 1989), *appeal dismissed*, 993 F.2d 875 (3d Cir. 1993).

¹⁴ *Basic*, 485 U.S. at 255.

company and its business. . . . Misleading statements will therefore defraud purchasers of stock even if the purchasers do not directly rely on the misstatements.¹⁵

The Second Circuit Court of Appeals explained *Basic* in *In re Salomon*¹⁶ as follows: “The *Basic* Court thereby set forth a test of general applicability that where a defendant has (1) publicly made (2) a material misrepresentation (3) about stock traded on an impersonal, well-developed (i.e., efficient) market, investors’ reliance on those misrepresentations may be presumed.”¹⁷ Integral to any court’s analysis is thus the determination of whether the securities held by the security holders are traded in an efficient market. In *Cammer v. Bloom*,¹⁸ the district court detailed a five-factor test (hereafter “*Cammer* factors”) for determining the efficiency of equity markets.¹⁹ The factors important to the *Cammer* court for establishing that stocks are traded in an efficient market include: (1) a large weekly trading volume;²⁰ (2) a significant number of securities analysts following and reporting on a company’s stock;²¹ (3) the

15 Peil v. Speiser, 806 F.2d 1154, 1160 (3d Cir. 1986) (citation omitted).

16 *In re Salomon Analyst Metromedia Litig.*, 544 F.3d 474 (2d Cir. 2008).

17 *Id.* at 481.

18 *Cammer*, 711 F. Supp. at 1286–87.

19 *Id.*; see also *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 208 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011); *Krogman v. Sterritt*, 202 F.R.D. 467, 474 (N.D. Tex. 2001); *In re 2TheMart.com, Inc. Sec. Litig.*, 114 F. Supp. 2d 955, 963–64 (C.D. Cal. 2000).

20 *Cammer*, 711 F. Supp. at 1286. Weekly trading volume has been called possibly “one of the most important” of the *Cammer* factors. See *Krogman*, 202 F.R.D. at 474.

The reason the existence of an actively traded market, as evidenced by a large weekly volume of stock trades, suggests there is an efficient market is because it implies significant investor interest in the company. Such interest, in turn, implies a likelihood that many investors are executing trades on the basis of newly available or disseminated corporate information.

Cammer, 711 F. Supp. at 1286.

21

The existence of such analysts would imply, for example, the PMM reports were closely reviewed by investment professionals, who would in turn make buy/sell recommendations to client investors. In this way the market price of the stock would be bid up or down to reflect the financial information contained in the PMM reports, as interpreted by the securities analysts.

Cammer, 711 F. Supp. at 1286 (footnote omitted). See also *In re Xcelera.com Sec. Litig.*, 430 F.3d 503, 514 (1st Cir. 2005) (“[T]he greater the number of securities analysts following and reporting on a company’s stock, the greater the likelihood that information released by a company is being relied upon by investors.”).

presence of market makers and arbitrageurs who are able to react swiftly to company news and drive the price;²² (4) the eligibility of the company to file an S-3 Registration Statement²³ for its public offerings; and (5) “empirical facts showing a cause and effect relationship between unexpected corporate events or financial releases and an immediate response in the stock price.”²⁴ In this paper, we primarily focus on cause-and-effect, or the fifth *Cammer* factor, for two reasons. First, the empirical methods utilized by experts to test the cause-and-effect relationship often can be confusing and misleading. And second, because many courts appear to rely heavily on the cause-and-effect *Cammer* factor to determine whether a security trades in an open,

22 *Cammer*, 711 F. Supp. at 1286–87 (“The existence of market makers and arbitrageurs would ensure completion of the market mechanism; these individuals would react swiftly to company news and reported financial results by buying or selling stock and driving it to a changed price level.”). See also *In re Xcelera.com*, 430 F.3d at 515 (“A market-maker is ‘[o]ne who helps establish a market for securities by reporting bid-and-asked quotations’ (the price a buyer will pay for a security and the price a seller will sell a security).” (quoting BLACK’S LAW DICTIONARY (8th ed. 2004))). A market-maker also “stands ready to buy or sell at these publicly quoted prices.” *Id.* (quoting *Lehocky v. Tidel Techs., Inc.*, 220 F.R.D. 491, 508 n.24 (S.D. Tex. 2004)).

23 An S-3 Registration Statement is a SEC registration form that may be used in a public offering by a company that: “ha[s] been filing reports under the Exchange Act for at least thirty-six months and either ha[s] outstanding \$150 million of voting stock held by nonaffiliates or \$100 million of such stock outstanding coupled with an annual trading volume of three million shares per year.” *Cammer*, 711 F. Supp. at 1271 n.5. “[C]ompanies entitled to issue new securities using SEC Form S-3 would almost by definition involve stocks trading in an ‘open and developed’ market.” *Id.* at 1277. See also *Teamsters Local 445 Freight Div. Pension Fund v. Bombardier, Inc.*, No. 05 Civ. 1898(SAS), 2006 WL 2161887, at *7 (S.D.N.Y. Aug. 1, 2006), *aff’d*, 546 F.3d 196 (2d Cir. 2008) (“Courts have found that the SEC permits an S-3 Registration Statement ‘only on the premise that the stock is already traded on an open and efficient market, such that further disclosure is unnecessary.’” (quoting *O’Neil v. Appel*, 165 F.R.D. 479, 502 (W.D. Mich. 1996))).

24 *Cammer*, 711 F. Supp. at 1287. The court further explained that:

This, after all, is the essence of an efficient market and the foundation for the fraud on the market theory.

. . . .

[O]ne of the most convincing ways to demonstrate [market] efficiency would be to illustrate, over time, a cause and effect relationship between company disclosures and resulting movements in stock price.

Id. at 1287, 1291. See also *Krogman*, 202 F.R.D. at 477 (“[I]n an efficient market, a stock’s price remains relatively stable in the absence of news, and changes very rapidly as the market receives new and unexpected information.”); *In re SCOR Holding (Switz.) AG Litig.*, 537 F. Supp. 2d 556, 574 (S.D.N.Y. 2008) (citing *Cammer*, 711 F. Supp. at 1286–87); *In re Xcelera.com*, 430 F.3d at 511–12.

developed, and efficient market—a prerequisite for a class-wide presumption of reliance and, thus, for class certification.

The *Cammer* court found this “cause-and-effect” or fifth factor to be “the essence of an efficient market and the foundation for the fraud on the market theory.”²⁵ Subsequent decisions have also held this cause-and-effect factor to be the most important.²⁶ The theoretical basis for this view is that because an efficient market is one in which “information important to reasonable investors . . . is immediately incorporated into stock prices,”²⁷ the cause-and-effect relationship between a company’s material disclosures and the security price is normally the most important factor in an efficiency analysis.²⁸ In fact, certain experts have suggested that the fifth *Cammer* factor is the only one relevant for evaluating whether a security trades in an open, developed, and efficient market.²⁹

Because the fifth *Cammer* factor appears to be the most direct test of market efficiency, courts often rely more heavily on this factor, rather than assigning equal weight to each of the five factors. Similarly, in cases where there might be issues associated with the security price data, courts may more greatly discount the fifth factor relative to the other four factors. Reliability of available data is generally not consistent across all securities.³⁰ Data describing each company’s specific trading activity (say, volume) and the data

25 *Cammer*, 711 F. Supp. at 1287.

26 *Id.* See *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 210 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011); *In re 2TheMart.com, Inc. Sec. Litig.*, 114 F. Supp. 2d 955, 964 (C.D. Cal. 2000) (“The Court concludes that the facts alleged in the complaint are plainly sufficient to allege a cause and effect relationship between disclosures of unexpected events and an immediate response in the stock price. Therefore, Plaintiffs have fulfilled the fifth factor in the *Cammer* test and, thus, have adequately pleaded the element of reliance.”).

27 *In re Burlington Coat Factory Sec. Litig.*, 114 F.3d 1410, 1425 (3d Cir. 1997) (citation omitted).

28 *Cammer*, 711 F. Supp. at 1287. See also *In re DVI, Inc. Sec. Litig.*, 639 F.3d 623, 634 (3d Cir. 2011).

29 *In re HealthSouth Corp. Sec. Litig.*, 261 F.R.D. 616, 633 (N.D. Ala. 2009).

They focus almost exclusively on the price response factor to argue that the HealthSouth market was not efficient, and largely disregard the other factors. In fact, Professor Gibbons asserts that the factors other than price reaction are merely characteristics of securities trading in an efficient market and not economic tests of efficiency.

Id. (citing Gibbons Rept. I (doc. 1208) ¶ 39).

30 See Hartzmark, Schipani & Seyhun, *supra* note 5, at 692–96 for a discussion of how the lack of available data is related to the issue of transparency in securities markets.

on prices will have varying degrees of reliability. Or the methods used to gather the price data might impact the reliability of the empirical tests—say transaction price data versus derived price data. On the other hand, lack of transactions or volume data might limit the reliability of a turnover analysis employed to evaluate the first *Cammer* factor. We generally agree that the empirical tests of the price response to unanticipated information are important in any meaningful empirical analysis of the five *Cammer* factors and will assist the court in determining whether the security under scrutiny trades in an open, developed, and efficient market. However, like most empirical methods, there are imperfections in the empirical tests used to evaluate price response that might make these tests either of limited value or possibly misleading as indicators of market efficiency. We argue that, should these limitations exist, courts might at times want to place greater reliance on the empirical tests of the other four *Cammer* factors. We discuss certain limitations below.

Further, because the litigation is generally focused on the securities issued by an individual company, examining price response throughout the class period calls for types of analyses that are not commonly utilized in academic research where the focus is on portfolios or indexes. The unique nature of a time-series of the price/return of a single security creates a plethora of statistical problems. In addition, idiosyncratic elements associated with the price movements of a specific security, such as trends induced from the leakage of information, might reduce the reliability of empirical tests evaluating cause-and-effect. Because of this challenge and others, courts often appear to be more realistic and narrowly define reliance by examining price efficiency only on those dates when there were corrective disclosures,³¹ rather than relying on flawed tests of price inefficiency *throughout* the class period.³² In the more narrow case, should the empirical tests of the fifth

31 For example, Macey et al. suggest:

We have argued that courts need not consider whether a security trades in an efficient or inefficient market; rather, courts should examine whether a misstatement caused a security to trade at an artificially high or low price. The inquiry devolves then into whether and how rapidly the market responded to the alleged misstatement.

Jonathan R. Macey et al., *Lessons from Financial Economics: Materiality, Reliance, and Extending the Reach of* Basic v. Levinson, 77 VA. L. REV. 1017, 1049 (1991).

32 See *In re Polymedica Corp., Inc. Sec. Litig.*, 453 F.Supp.2d 26 (D. Mass. 2006). In a rather unusual decision, the court found that during the first three years of the class period the

Cammer factor be focused on cause-and-effect on the corrective disclosure dates, it might behoove the court to first examine evidence associated with the first four *Cammer* factors throughout the class period to determine whether there is support for the security trading in an open and developed market. These first four *Cammer* factors describe trading activity throughout the class period, or what we call the “operational” efficiency.³³ The court would move on to examine the fifth *Cammer* factor only if the tests of the first four *Cammer* factors were supportive of operational efficiency; and the empirical support would be drawn from evidence only as it related to the corrective disclosure dates. In essence, the analysis would loosely resemble the approach used to examine loss causation. In other words, to evaluate the fifth *Cammer* factor, the court would ask simply whether the revelation(s) of the misstatements or fraud (and any other simultaneously disclosed confounding information) resulted in significant and rapid price response(s).³⁴ Although we do not endorse this as the appropriate empirical analysis, we do discuss it further below.

III. EMPIRICAL METHODS TO EVALUATE THE FIFTH *CAMMER* FACTOR

To support the conclusion that a class-wide presumption of reliance applies based on the fraud on the market theory, most courts rely on the experts’ use of an empirical approach called event study. This approach uses a so-called market model to partition a company’s security price movement on each trading day in the class period into three parts: the movement caused by market-wide factors, or the “market effect”; the movement caused by industry-wide factors, or the “industry effect”; and the movement caused by “firm-specific effect.” Once the factors are partitioned and firm-specific effects are isolated to determine if the market reacts efficiently to disclosures, the court is generally presented empirical evidence showing whether the firm-specific abnormal returns or returns in excess of what is predicted by the

common stock of Polymedica traded in an efficient market, while during the last eight months of what was called a “Contested Period,” the common stock traded in an inefficient market.

33 See Hartzmark, Schipani & Seyhun, *supra* note 5.

34 See *In re DVI*, 639 F.3d at 634 n.17 (3d Cir. 2011) (“This [fifth] factor is related to, but broader than, loss causation. In analyzing market efficiency, courts often look to all corporate disclosures and news events. Conversely, in analyzing loss causation, courts generally look to corrective disclosures.”).

statistical model are statistically significant. The court examines those days throughout the class period when either, (a) there appear to be material or statistically significant firm-specific abnormal returns, and to determine whether there are associated disclosures, or conversely (b) there are material or corrective disclosures, and to determine whether there are associated material or statistically significant firm-specific abnormal returns.

A. The Market Model and Event Study Methodology

In the case of equity securities, these firm-specific effects are calculated after adjusting for the overall market factor and factors related to firm size and the book-to-market equity.³⁵ For debt securities, additional factors are introduced to adjust for credit and maturity risk of the debt.³⁶ Eugene F. Fama and Kenneth R. French summarize these debt and equity factors:

[There are] five common risk factors in the returns on stocks and bonds. There are three stock-market factors: an overall market factor and factors related to firm size and book-to-market equity. There are two bond-market factors, related to maturity and default risks. Stock returns have shared variation due to the stock-market factors, and they are linked to bond returns through shared variation in the bond-market factors.³⁷

Fama and French specify the following regression:

$$R_t - R_F = \alpha + \beta(RMO) + \pi SMB + \eta HML + \mu TERM + \delta DEFAULT + \gamma IND + e.^{38}$$

In this equation, R_t is the return to the security in question, R_F is a measure of the risk-free return and RMO is a proxy for the market return. SMB and HML are variables included in the equation to adjust for price movements associated with companies of comparable firm size and book-to-market value, while the $TERM$ and $DEFAULT$ variables are included to

35 Eugene F. Fama & Kenneth R. French, *Common Risk Factors in the Returns on Stocks and Bonds*, 33 J. FIN. ECON. 3, 34 (1993).

36 *Id.*

37 *Id.* at 3.

38 *Id.* at 35. This equation is a time-series where the variables are measured at comparable times, e.g., daily, monthly or more generally when trading is observed. Other than for the firm's return, we have left out the time subscript for the other variables.

adjust for price movements in debt issues with comparable time-to-maturity and credit risk. The IND variable is included to adjust for price movements associated with competitors or the industry. TERM is generally measured as $LTG - R_F$, where LTG is the long-term government bond return. DEFAULT is generally measured as $CB - LTG$, where CB is the return on a proxy for the market portfolio of corporate bonds.³⁹

This equation is then used to estimate daily abnormal returns, which are calculated by taking the actual daily return of the security and subtracting it from the predicted return based on the results from the Fama-French specification of the regression. Statistical tests are then used to evaluate whether the calculated abnormal return is material or, in economic terms, is statistically significant.⁴⁰

The following summarizes the basic four-step process to estimate these abnormal returns and to determine if they are material. First, econometric regression methods allow an expert to estimate the parameters or coefficients in the equations above, namely α , β , π , η , μ , δ , and γ . Data from a period prior to the class period is generally used. In certain cases, however, because of lack of data or concerns about the underlying structure or stability of the data, the coefficients might be estimated from records during the class period or, where appropriate, using data from the post-corrective disclosure period.⁴¹ The second step uses the estimated coefficients and the observed measures of RMO, SMB, HML, TERM, DEFAULT and IND on each date to calculate the abnormal firm-specific return. On each date, the predicted firm-specific effect is subtracted from the actual return to calculate the abnormal return.⁴² In the third step, statistical tests are employed to assess the statistical significance of the firm-specific abnormal return for each date or, in other words, to determine whether the abnormal return is significantly different from zero with a reasonable degree of certainty.⁴³ Finally, in the class certification process, in a normal event study, there is an examination of the relationship between the abnormal returns, the statistical significance of those returns, and the information content found in specified disclosures.

³⁹ *Id.*

⁴⁰ Macey et al., *supra* note 31, at 1035–36.

⁴¹ In fact, in certain cases, the regression coefficients are updated for each date when abnormal returns are calculated using a method of rolling regressions.

⁴² Macey et al., *supra* note 31, at 1032.

⁴³ A statistically significant price change is one that is sufficiently large, after controlling for market factors, that it would occur by chance only 5% of the time.

B. Using the Event Study Methodology to Relate Price Reactions to Disclosures

To test whether a stock price has reacted to a disclosure, the expert examines the stock's abnormal return in a designated time period after the market participants are assumed to have received the information and questions the extent to which the actual return on the stock differs from what the predicted return would have been without the firm-specific news.⁴⁴ Assuming the expert has correctly identified the date and time of the news release, has established the appropriate period of time over which it is reasonably expected that the price should react, and no other confounding firm specific news reaches the market at the same time, the abnormal return represents a measure of the impact of the news on the stock price. Thus, this approach allows the court to isolate and examine the relationship between disclosures and unusual or significant abnormal movements in the prices of the stocks, bonds, or other securities.

In most academic-based event studies, there is a very specific type of "cause" that is examined; a cause that is well-defined by a particular type of information that is released, such as:

- (a) earnings,
- (b) dividends,
- (c) discoveries,
- (d) new issues,
- (e) lawsuits the corporation files,
- (f) lawsuits filed against the corporation,
- (g) updated projections,
- (h) regulatory changes, and
- (i) any other event that will impact the future cash flow of the corporation.

Using empirical methods, the expert attempts to determine the relationship between the particular type of cause and the subsequent effect on price. Thus, for example, an expert might ask whether disclosures of

⁴⁴ The discussion in this section is based on the commonly used event study methodology, which is a widely-accepted approach used in academic finance. A good summary of the approach is in Macey et al., *supra* note 31.

unanticipated corporate control actions cause a material or statistically significant price reaction.

In securities litigation, the event study inevitably examines a confluence of different types of information that are released.⁴⁵ It is not unusual that over a class period the corporation will announce earnings, dividends, discoveries, new issues, lawsuits it files, lawsuits filed against it, projections, regulatory changes that impact its business, and more. In an efficient market, each one of these releases of information will be expected to have a different and possibly material impact on the security price. Should the expert wish to reliably demonstrate that efficiency exists based on cause-and-effect by using a specific type of disclosure—say, earnings—he then must deal with the fact that the class period is generally too short to have a sufficient number of disclosures to infer statistical significance. For example, even when the class period is four years long, there are only sixteen earnings announcements—hardly a large enough sample to reliably test whether there exist any systematic relationships between earnings disclosures and price movements. Furthermore, the empirical results from such studies do not suggest that all of the information of a certain type will have the same impact, but only that, on average, there will be a reasonably well-defined impact. Finally, if the company's business as reflected in its earnings is predictable (or possibly engineered to be predictable) throughout the class period, then all earnings announcements (other than the corrective disclosure) will be anticipated. Thus, assuming an efficient market, there are instances when there is no relationship between earnings announcements and price reactions.

In securities litigation, the court is therefore confronted with the following problem: how can it examine cause-and-effect throughout the class period when there are few, if any, systematic relationships between a diverse

45 *See In re Countrywide Fin. Sec. Litig.*, 273 F.R.D. 586, 618 (C.D. Cal. 2009) ("It should be obvious, even to those without a background in statistics or econometrics, that the events for study should be selected using criteria that are as objective as possible. Further, those criteria should be determined before looking at the result to be studied (here, stock returns). Relatedly, unless the expert uses articulable objective criteria, it is difficult to evaluate the probative value of expert evidence without evaluating also the expert's own credibility. Of course, many decision points in designing an event study require some subjectivity: identifying news, categorizing which news is "material," and determining whether news should have a certain (albeit rough) magnitude of positive or negative influence on price are all subjective determinations. But such subjectivity should be minimized."). Although we generally agree with what the court suggests about subjectivity and choice of events, the proposition is somewhat unrealistic, as this article indicates.

set of disclosures and price reactions? Moreover, because litigation is completed *after-the-fact*, how can the court credibly examine what price reaction would have been predicted *ex ante* based on the unanticipated component of a specific disclosure? Therefore, other than the examination of the general relationship between the price reactions associated with the one, two, or more corrective disclosures specified in a complaint, how does one choose the other dates to examine to support a claim that the market is open, developed, and efficient?

C. The Reverse Event Study Approach to Choosing Dates

In this paper we suggest that experts should use a non-arbitrary selection method to identify the additional days to examine beyond the corrective disclosure dates specified in a complaint. Using an event study, we first identify those days with significant price reactions (i.e., effects) and include all of them in the analysis to follow. We then attempt to decipher the disclosures (if they exist) causing the price reaction in order to evaluate whether there exists a systematic relationship between all “effects” and related “causes.”

This approach to selecting additional days to include in the analysis can be criticized for not allowing one to objectively define *ex ante* systematic relationships between price movements and specific types of events or news. It might be argued that “causes” (i.e., disclosures) must be identified in advance of attempting to relate those “causes” to price “effects”, or in other words, that the only meaningful way is to examine possible “effects” and to see if there are identifiable “causes” in advance. This critique suggests that all the relevant “events” must be chosen in advance of any statistical analysis of price movements; otherwise, it induces a bias into the analysis of the fifth *Cammer* factor because the additional days used for the analysis are chosen by subjective cherry-picking.⁴⁶

Although this might be an interesting criticism in theory, it fails to acknowledge the difficulty, if not the impossibility, of employing an allegedly objective approach to determine the likelihood that each disclosure made

46 See *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 211 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011) (“Defendants question this event study, arguing that . . . the study first identified statistically relevant price movements and then thereafter identified corresponding news events . . .”). For a different contradictory approach, see *In re Countrywide Fin. Sec. Litig.*, 273 F.R.D. at 618 (“[T]hose criteria should be determined before looking at the result to be studied . . .”).

throughout the class period is (a) unexpected, (b) material, and (c) has a predictable price response. In reality, other than the corrective disclosure dates, the other dates cannot be chosen in advance in an objective manner. In theory, the parties could choose an objective and omniscient third-party expert to examine and link every disclosure. This expert would then be asked to advance a theory as to why each disclosure would or would not have a significant price response. It is not clear whether this alternative would be a reliable option. It would certainly be an expensive option and would raise the following question: if the independent expert was so good at predicting *ex ante* cause-and-effect relationships, why was he not out trading? The fact is that the critics of our approach do not have a reasonable alternative for selecting the additional dates based on an objective evaluation of the information content in a disclosure.

The reason for the critics' lack of an alternative can be summarized in two words: objectivity and replication. The alternative of arbitrarily choosing days based on personal evaluations (which really amount to preferences) of what is deemed "material" and "unanticipated," and then using these days to examine whether the abnormal returns are of the predicted direction and magnitude, would result in more damning criticism. The first criticism of this alternative approach is that the other side to the litigation would be unable to replicate the selection process for choosing the critical days—especially *ex post*. Second, because the matter is being litigated *after-the-fact*, this alternative approach is open to the criticism that the allegedly objective evaluation is based on some subjective measures.

In *In re DVI*, the court in fact observed that "Lead Plaintiffs [had] generated an event study in which it identified the days that the Senior Notes saw statistically significant price changes and then attempted to match these to identifiable news events" in an attempt to establish the requisite cause and effect relationship between price movements in the Senior Notes and the release of public information about DVI.⁴⁷ Although the Defendants' expert argued that this data analysis sequence should be switched—that one should first identify a news event and then look for a notable change in price—the court ultimately found that:

[A] study that first focused on news events and only then attempted to analyze price fluctuations would be ambiguous: if a stock price was seemingly unaffected on the date of a news release, one would not be

⁴⁷ *Id.* at 215.

able to discern whether this was due to market inefficiency or indifference to that particular news event.⁴⁸

Overall, much of the criticism as to the choice of critical days is unrealistic and clearly demonstrates a lack of understanding of how event study methodology applies to a single-security issuer or to an event study without a specifically defined “event” or type of “news.” Not only have courts agreed with this approach,⁴⁹ but this approach is supported by academic research,⁵⁰ which confirms that by using it, one is better able to develop a reliable and scientific-based opinion related to the fifth *Cammer* factor by utilizing *all pricing* and *disclosure* information throughout the entire class period.

Below we cite to numerous academic studies where, as the first step, the statistically significant abnormal returns (effects) are identified, only to be followed by a second step where the causal events are examined. These academic authors understand that the event study methodology is first and foremost a statistical exercise for assessing whether there is a statistically significant abnormal return. In other words, employing the statistical tools of a financial economist, an objective researcher can conclude, with a defined level of certainty, that the security price change did not result from random variation and instead is significantly different from the average daily variations.⁵¹

Whether one examines cause-and-effect by pre-choosing the dates or by examining the dates *ex post* depends on the purpose of the academic research. For example, if there are not well-defined events, the academic researcher might look for the largest returns and attempt to match them with causal events.⁵² Numerous academic publications have used the methodology we propose: look for sharp changes in volatility or price movements (i.e., returns) then look for related disclosures. For example Michael J. Fleming and Eli M. Remolona evaluate what information might drive large price changes in bond markets:

48 *Id.* at 211.

49 *See, e.g., In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011); *In re HealthSouth Corp. Sec. Litig.*, 261 F.R.D. 616 (N.D. Ala. 2009).

50 *See infra* notes 53–55 and accompanying text.

51 JOHN Y. CAMPBELL, ANDREW W. LO & A. CRAIG MACKINLAY, *THE ECONOMETRICS OF FINANCIAL MARKETS* 150 (Princeton University Press 1997) (“Central to any event study is the measurement of the abnormal return.”).

52 Generally, other than the corrective disclosure dates documented in a complaint, there are no other days specified allowing for a systematic examination.

[We] attempt to identify information that may account for the sharpest price changes and the most active trading episodes.

....

[We] find that each of the twenty-five sharpest price changes and each of the twenty-five greatest trading surges can be associated with a just-released announcement.

....

First, we follow Cutler, Poterba, and Summers (1989) in examining the largest price changes and determining the extent to which these changes coincide with the release times of announcements.⁵³

As alluded to by this Fleming and Remolona excerpt, one of the mostly widely cited academic publications to employ the reverse cause-and-effect methodology is the work by Cutler, Poterba and Summers:

[We] analyze the largest stock market movements of the last fifty years and review coincident news reports to identify, where possible, the proximate causes of these moves.

....

An alternative strategy for identifying the importance of news is to examine large changes in share prices and related news developments. [We list] the fifty largest one-day returns on the Standard & Poor's Composite Stock Index since 1946, along with the *New York Times* account of fundamental factors that affected prices.⁵⁴

There are numerous other examples of such studies.⁵⁵

53 Michael J. Fleming & Eli M. Remolona, *What Moves the Bond Market?*, 3 ECON. POL'Y REV. 31, 31–32, 35 (1997).

54 David M. Cutler, James M. Poterba & Lawrence H. Summers, *What Moves Stock Prices?*, 15 J. PORTFOLIO MGMT. 4, 7–8, 9 (1989).

55 Note the following examples:

In this article, tick data on the S&P 500 futures contract and newswire searches are used to match events to stock price changes.

....

Given each large change, newswires were searched to see if an event could be found that led to the change.

....

Thus, there is substantial academic support for our approach, which suggests it is a proper method for choosing the dates to include in an analysis. As the foregoing research indicates, it is both logical and reliable to first gather a sample of critical days over the class period using a market model. We call these the “event dates.” We follow the identification of the event dates with an analysis of the “broad set of events” represented in the disclosures. This broad set of events could include announcements of earnings, dividends, stock splits, or security issuance, among others.

The next step was to see which event, if any, led to the large and rapid change.

Ray C. Fair, *Events That Shook the Market*, 75 J. BUS. 713, 713, 716 (2002).

We identify samples of losers and winners by selecting daily stock price returns in excess of 10% (sign ignored) and determine whether these samples over- or underreact. We then identify “informed” events, which correspond to announcements in the *Wall Street Journal* (*WSJ*), and “uninformed” events, which are not explained in the *WSJ*.

Stephen J. Larson & Jeff Madura, *What Drives Stock Price Behavior Following Extreme One-Day Returns*, 26 J. FIN. RES. 113, 113 (2003).

We first examine the magnitude and frequency of the volatility changes in the DJIA detected by the Wichern, Miller, and Hsu (1976) methodology. We then turn our attention to investigating the nature of the price level and subsequent return reactions to these volatility changes.

....

In an attempt to identify the causes for the identified volatility shifts, we use *Day by Day*, *Facts on File*, and *Keesing's Contemporary Archives* to search over the last day of the first block as well as all the days in the second block for the release of extraordinary information for all events.

Robert A. Haugen, Eli Talmor & Walter N. Torous, *The Effect of Volatility Changes on the Level of Stock Prices and Subsequent Expected Returns*, 46 J. FIN. 985, 990, 992 (1991).

We begin with a sample of abnormally large price changes.

....

[W]e are using price change as a proxy for a significant change in investor expectations....

....

The sample is divided into positive and negative events depending on whether the event day market adjusted abnormal return is positive or negative.

Mahesh Pritamani & Vijay Singal, *Return Predictability Following Large Price Changes and Information Releases*, 25 J. BANKING & FIN. 631, 632, 635–36 (2001).

This also raises a critical issue related to event studies such as those used by economists in most securities litigation. For an individual stock, discovery of all of the relevant disclosures is difficult and not always obvious, as relevant disclosures are not just limited to disclosures by the company itself, but may include, among others, disclosures about the relevant industry, the relevant sector, actual and potential competitors, actual and potential suppliers, and general market or credit conditions. These other disclosures might not name the company, but may be material news that impacts price response.

Even if all relevant disclosures were to be found, there then would emerge a new set of problems to solve. These are discussed below.

IV. PROBLEMS WITH THE EMPIRICAL METHODS GENERALLY USED TO EVALUATE THE FIFTH *CAMMER* FACTOR

As we have discussed, the general problem confronted by an expert in securities litigation when examining market efficiency is that of establishing *ex ante* how security prices should react (the “effects”) to given disclosures (the “causes”). Assuming the court agrees that to evaluate the fifth *Cammer* factor, selecting the dates can be reliably accomplished using the reverse event study methodology explained above, the next step is to utilize reliable techniques to evaluate market efficiency based on these dates. All the chosen dates within the class period can be categorized based on the observed relationships between the statistical significance of the abnormal returns and the disclosures. The four categories, as shown in Table 1, include:

- 1. No disclosure and no statistically significant abnormal return.
- 2. Disclosure and statistically significant abnormal return.
- 3. No disclosure and statistically significant abnormal return.
- 4. Disclosure and no statistically significant abnormal return.

Observation on a Date	No Disclosure	Disclosure
No Statistically Significant Abnormal Return	Efficient Market	Inefficient Market (?)
Statistically Significant Abnormal Return	Inefficient Market (?)	Efficient Market

Table 1

One will find that on most dates, the observed relationship is that of no disclosure and no statistically significant abnormal return, which is consistent

with market efficiency and supports the fifth *Cammer* factor. On many fewer dates (in some cases designed to be no more than 5% of the class period)⁵⁶ one will find a statistically significant abnormal return and a related disclosure, a finding that is also consistent with market efficiency and supports the fifth *Cammer* factor.⁵⁷ It is in the other two categories in Table 1 with the question marks (?), which we call the “off-diagonal” categories, where there is potential disagreement as to whether the security trades in an efficient market. Thus, we ask the following two questions:

- i) If there is a significant return, but no news, is this evidence that the security trades in an inefficient market?⁵⁸
- ii) If there is news, but no significant return, is this evidence that the security trades in an inefficient market?

To answer these questions, we examine the reasons why, in the absence of a disclosure, we might observe statistically significant abnormal returns. And why, with certain disclosures, we may not observe statistically significant abnormal returns. We then propose a statistical test utilizing all information throughout the class period, including the information from the two off-diagonal categories in Table 1, to determine if there is support as to whether the security trades in an inefficient market.

A. Imperfections in Securities Markets and the Market Model

Parties frequently present empirical analyses to courts based on a naïve assumption that “theoretically, in a perfectly efficient market, there should be no significant price movements without some identifiable news event”⁵⁹ or conversely, that there should be significant price movements only with some

56 For example, when the expert undertakes an intervention analysis (explained in more detail later) the analysis is based on a 5% significance level.

57 Throughout this article, we implicitly assume that the sign of the abnormal return agrees with the types of *unanticipated* disclosures. That is, we assume that the security prices rise abnormally after *unanticipated* good news for the security and security prices fall abnormally after *unanticipated* bad news for the security. If the abnormal return went the opposite way, this would also be inconsistent with market efficiency.

58 See *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 211 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011) (“Defendants question this event study, arguing that . . . there were a large number of days during which DVI stock experienced a significant change despite no identifiable public disclosures.”).

59 *Id.* at 211–12.

identifiable news event.⁶⁰ The courts have realistically concluded that markets are not perfect, suggesting that courts “cannot decide efficiency based purely on theory, but must make a determination in the context of the real world.”⁶¹ In his classic treatise, *Foundations of Finance*, Dr. Fama defines an efficient capital market as “a market that is efficient in processing information. The prices of securities observed at any time are based on ‘correct’ evaluation of all information available at that time. In an efficient market, prices ‘fully reflect’ available information.”⁶²

A second relevant issue when examining market efficiency is the cost associated with obtaining, processing, and trading on information. Dr. Fama also adds a touch of reality by suggesting the following:

[Financial economists] remember that no null hypothesis,⁶³ such as the hypothesis that the market is efficient, is a literally accurate view of the world. It is not meaningful to interpret the tests of such a hypothesis on a strict true-false basis. Rather, one is concerned with testing whether the model at hand is a reasonable approximation to the world, which can be taken as true, at least until a better approximation comes along.⁶⁴

In his sequel, Dr. Fama wrote:

I take the market efficiency hypothesis to be the simple statement that security prices fully reflect all available information. A precondition for this strong version of the hypothesis is that information and trading costs, the costs of getting prices to reflect information, are always 0.⁶⁵ . . . A weaker and economically more

⁶⁰ *Id.*

⁶¹ *Id.* at 212.

⁶² EUGENE F. FAMA, *FOUNDATIONS OF FINANCE* 133 (Basic Books 1976). Dr. Fama is the Robert R. McCormick Distinguished Service Professor of Finance at the University of Chicago, Graduate School of Business. With almost 100 publications in many of the most prestigious economics and finance journals, he is widely perceived as the father of modern finance and author of the efficient market hypothesis.

⁶³ In statistics, a null hypothesis is a hypothesis set up to be nullified or refuted in order to support an alternative hypothesis. When used, the null hypothesis is presumed true until statistical evidence in the form of a hypothesis test indicates otherwise.

⁶⁴ FAMA, *supra* note 62, at 142.

⁶⁵ Empirical tests should avoid ignoring trading activity based on private information that is not disclosed on the day that it takes place. This activity might cause significant abnormal

sensible version of the efficiency hypothesis says that prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed the marginal costs. . . .

Since there are surely positive information and trading costs, the extreme version of the market efficiency hypothesis is surely false.⁶⁶

Therefore, courts and many academics will agree that “[e]fficiency is a relative concept, a matter of degree.”⁶⁷

B. A Change in the Market’s Expectations that is Unobserved

Market expectations depend on all available information, regardless of whether the sources for those expectations or changes thereof are readily observable to an armchair empiricist. Without knowing the market expectations, it is impossible to evaluate whether any disclosure is good or bad relative to what the market expected, and thus, it is difficult, if not impossible, to gauge whether the market reacted appropriately to the information.

An example will clarify this point. Suppose that a firm consistently announces its cash dividend on the last trading day of each quarter. Now, suppose that a quarter-end date passes without a dividend announcement from the firm. Rational market participants might immediately conclude based on the absence of an announcement that something is amiss at the firm. In an efficient market, the absence of such a dividend announcement might rationally cause stock prices to decline. Similarly, at some later date, when the firm discloses that something really was amiss, in an efficient market the stock price may not react much, if at all, because this negative expectation had already been incorporated into the stock price. Another example is when firms which voluntarily disclose the expected date of their next quarterly earnings announcement fail to make an announcement when expected. Academic studies show that when firms miss the expected date, earnings on average tend to be worse than expected. Consequently, in

returns. This activity could include large block trades, institutional rebalancing, or insider trading.

66 Eugene F. Fama, *Efficient Capital Markets: II*, 46 J. FIN. 1575, 1575 (1991) (citations omitted).

67 *In re Enron Corp. Sec. & "ERISA" Litig.*, 529 F. Supp. 2d 644, 750 (S.D. Tex. 2006); *see also* Fama, *supra* note 66.

reaction to the absence of the expected disclosure, subsequent investor activity sends the prices of late-reporting firms down. These price declines are both economically and statistically significant.⁶⁸ Hence, we assert that in an efficient market, in the absence of a disclosure, there might be associated statistically significant abnormal returns. Similarly, with certain (seemingly material) disclosures, there may not be any associated statistically significant abnormal returns.⁶⁹

C. Statistical Methods Utilized to Evaluate Systematic Cause-and-Effect Relationships are Imperfect

Market models are an attempt to describe real world relationships using statistical methods and, by construction, are imperfect. The market model empirically relates the return on a security to the return on the market portfolio⁷⁰ and to the extent of the security's responsiveness. The measure of the security's responsiveness, or sensitivity to the market portfolio, is estimated using a regression model and measured by the regression coefficient called "beta."⁷¹ The security's return also depends on conditions or factors that are unique or specific to the firm.⁷²

68 In addition, prices continue to fall each day earnings are not announced. *See, e.g.*, Mark Bagnoli, William Kross & Susan G. Watts, *The Information in Management's Expected Earnings Report Date: A Day Late, a Penny Short*, 40 J. ACCT. RES. 1275 (2002).

69 *See In re Scientific-Atlanta, Inc. Sec. Litig.*, 571 F. Supp. 2d 1315 (N.D. Ga. 2007).

Contrary to Defendants' argument, the mere absence of a statistically significant *increase* in the share price in response to fraudulent information does not "sever the link" between the material misstatements and the price of the stock. Rather, price stability may just as likely demonstrate the market consequence of fraud where the alleged fraudulent statement conveys that the company has met market expectations, when in fact it has not.

Id. at 1340–41.

70 Examples of possible portfolios include the S&P 500 Index, Russell 2000 Index, NYSE Composite Index, etc.

71 For comparison purposes, Brealey, Myers and Allen show examples of betas for some U.S. common stocks: Amazon.com of 3.25, Boeing of 0.56, Coca-Cola of 0.74, Dell Computer of 2.21 and Exxon Mobil of 0.40. *See* RICHARD A. BREALEY, STEWART C. MYERS & FRANKLIN ALLEN, *PRINCIPLES OF CORPORATE FINANCE* 190 (8th ed., McGraw-Hill/Irwin 2006).

72 These might include, for example, industry-wide effects that are not picked up by a market proxy. In addition, as discussed above, the relative size of the company and its relative growth rate might explain some of the variation in its return.

In addition, to simplify the estimation process, regression parameters for market models are generally assumed to be linear, when many actual relationships between the security returns and the explanatory variables are non-linear. One obvious example is with bond prices, wherein the relationship between the explanatory variables (generally broad indices) and the bond returns likely changes as the convertible bond price moves in- and out-of-the-money.⁷³ Also, with fixed coefficients, a substantial daily return of one of the explanatory variables might induce what is perceived to be significant abnormal daily return for the security under examination, whereas the cause of the estimated abnormal daily return has nothing whatsoever to do with the security under investigation.

1. Imperfections in the Relationship of the Market Return and the Individual Stock Return

From the equation in the market model above,⁷⁴ we showed that we use the measure of the return to a market index (RMO) to explain some or all of the variation in returns of the individual security. General market activity will not explain all variation and in fact, might literally induce significant abnormal daily returns for an individual security on a particular day. An example will clarify this point.

In the *DVI* matter, one of the experts, employing a technique often used in academic research, estimated a simplified version of the market model by implicitly assuming that the coefficients α , π , η , μ , δ , and γ in the Fama and French equation above were all equal to zero and that the (β) beta coefficient was equal to one. These implicit assumptions can be inferred from the court opinion because the expert calculated DVI's daily abnormal return as the "net-of-market return."⁷⁵ This means that the abnormal returns were calculated by simply subtracting the daily return to the market index from the

73 Suppose a \$1,000 face value convertible bond is convertible into twenty-five shares of common stock. In this case, the conversion price of the bond equals \$40 (\$1,000 divided by 25). If the conversion price equals the market price of the common stock, then the bond is said to be trading at-the-money. If the conversion price is less than the market price of the common stock, then the bond is said to be trading in-the-money. If the conversion price is greater than the market price of the common stock, then the bond is said to be trading out-of-the-money.

74 See *supra* Part III.A.

75 *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 211 n.24 (E.D. Pa. 2008), *aff'd*, 639 F.3d 623 (3d Cir. 2011) ("Defendants' event study model indicates that there was a net market return . . .").

daily return to DVI common stock. This approach implicitly assumes that movements in DVI daily stock price were explained wholly by one-to-one movements in the daily market index.⁷⁶ If this implicit assumption is false, it can also lead to erroneous observations of measured significant abnormal returns when in reality there is no disclosure and no actual abnormal return. Similarly, this implicit false assumption can lead to situations where there is a disclosure and no measured abnormal return.⁷⁷

2. *Capturing Market Expectations Accurately*

As described above, more complete market models often include factors that relate to the relevant industry, the relevant sector, actual and potential competitors, actual and potential suppliers, as well as general market or credit conditions.⁷⁸ Even with the inclusion of these other explanatory factors, however, the variation in the returns of these other factors is still unlikely to capture the true market expectations.

As an aside, most academic studies do not include indexes for the industry or competitors because they are examining portfolios of securities and not individual securities. This poses two somewhat contradictory problems. First, should a market model in a litigation context fail to include a variable for a competitor when it should, then a significant daily price movement of the competitor that is related to the industry of the litigant will not be used to adjust the daily return of the litigant. Thus, because of the omission of a relevant variable, it might appear that there are no firm-specific

⁷⁶ Generally, beta is estimated using a linear regression. It appears that in the *DVI* matter, the defendants' expert fixed beta at one.

⁷⁷ Because of this fixed coefficient, on July 29, 2002, we were able to find a significant price response of the DVI stock (i.e., an effect) without an identifiable firm-specific disclosure (i.e., a cause). On July 29, 2002, there was a significant abnormal net-of-market return of negative 7.11%; in other words, the stock allegedly declined by a substantial magnitude. We independently found that on July 29, 2002, the return to DVI common stock was only negative 1.93%—hardly a substantial price movement. However, because the Market Index increased by 5.18% on that day, the abnormal return to DVI common stock based on a net-of-market approach and calculation was negative 7.11%, which is computed by taking negative 1.93% (return to DVI common stock) and subtracting 5.18% (return to the market index).

⁷⁸ It appears that certain experts do not believe that indexes for peer groups or competitors are properly included in market models used in litigation. We believe this is misguided. See, e.g., *In re DVI Inc. Sec. Litig.*, 249 F.R.D. at 211 (“Defendants question this event study, arguing that (1) the inclusion of DVI’s competitors into this model is unusual and may have led to hard-to-interpret abnormal returns . . .”).

disclosures, but that there is significant abnormal price movement on that day.⁷⁹ The second related problem when estimating the market model while including industry or peer indexes is that there can be the same types of problems as those discussed above when using a market index. There is a trade-off when including additional variables for a competitor or a peer-index into a market model. For example, as discussed above, because the coefficients are fixed, a large abnormal return to the index (in this case, the peer-index) can and sometimes does induce significant abnormal returns for the security.

For a more specific example, assume that the relationship between a company and its competitor is estimated using a market model with data prior to the class period to be 0.5:1.0, so when the competitor return goes up by 10%, all else constant, it would be expected that the predicted firm-specific return would also go up by 5%. Now assume that within the class period, the same competitor's bankruptcy causes the competitor return to be negative 10%, but signals a positive but insignificant event for the company, so that the firm-specific actual return is small and positive on the date the rival makes its bankruptcy announcement. In this case, because the coefficient on the competitor return is fixed at 0.5, the company would have a large positive (and possibly significant) abnormal return because the company's actual return is positive, but the predicted return is negative 5% due to the competitor's large negative return.⁸⁰

79 Another example from the *DVI* matter will bring this to light: On May 9, 2000, the event study model based on the "net-of-market" return indicates that there was a statistically significant abnormal return of DVI stock of 10.04% with no associated news or event. However, because this model did not incorporate as an explanatory variable the daily returns of DVI's competitors or its peer group, the market model was unable to account for the fact that there was a 28% decline in the stock price of a rival following negative public disclosure about the rival that did not refer to DVI. For comparison, we calculated that on May 9, 2000, the net-of-market return was negative 6.59% (compared to its negative 10.04%). Under a 5% statistical significance level, the abnormal return we calculated would have been a statistically significant abnormal return. However, when we choose a different "filter" or significance level for our analysis, we did not find the return to be statistically significant on that day. *See id.* at 211 n.24.

80 In the *DVI* matter, the court understood this issue and stated:

(4) [T]here were a large number of days during which DVI stock experienced a significant change despite no identifiable public disclosures.

Each of Defendants' issues may be reconciled. First, the event study's inclusion of DVI's competitors was reasonably used to account for market- and sector-specific forces affecting the price of DVI stock. In at least one instance the inclusion of DVI's competitors was necessary to explain a significant price

3. *Private Information and Insider Trading*

Market models also ignore the potential impact on security returns of trading activity based on private information. This activity, which might include large block trades, institutional rebalancing, or insider trading, could be the unobserved “cause” of the “effect” (i.e., cause of a significant abnormal return). Therefore, experts who argue that all significant price movements must have an identifiable disclosure implicitly assume that significant price movements of the security could not result from trading on private information.

This is contrary to logic, academic research,⁸¹ and courts’ understanding.⁸² First, price reactions may occur in reaction to trading activity based on legally- or illegally-obtained private information. Some investors in possession of private information may engage in stealth trading to hide their intentions, resulting in price movements without a public disclosure.⁸³ Second, there is liquidity based trading. Individuals, institutional traders, or block traders might be rebalancing their portfolios due to liquidity concerns, which might cause significant price movements in the absence of “some identifiable news event.”⁸⁴ Since other market participants do not know the true reason behind a given trade (liquidity or private information), liquidity based trading will also result in a stock price reaction in an efficient market.

It is unrealistic to ignore the possibility of trading on private information and the fact that it might induce a large abnormal return. For example, what if insiders were trading on a particular day based on inside information?

change in DVI stock. Indeed, the reasonableness of Lead Plaintiffs’ model is reinforced by the similar results produced using Defendants’ own model.

Id. at 211.

81 Larson & Madura, *supra* note 55; Paul C. Tetlock, *Does Public Financial News Resolve Asymmetric Information?* 23 REV. FIN. STUD. 3520 (2010); Clara Vega, *Stock Price Reaction to Public and Private Information*, 82 J. FIN ECON. 103 (2006); Pavel Savor, *Stock Returns After Major Price Shocks: The Impact of Information* (November 2011) (unpublished working paper, on file with the Virginia Law & Business Review) *available at* <http://fnce.wharton.upenn.edu/documents/research/Stock%20Returns%20After%20Major%20Price%20Shocks%20-%20November%202011.pdf>.

82 *See, e.g., In re DVI Inc. Sec. Litig.*, 249 F.R.D. at 211–12.

83 *Id.* at 212 (citing Krogman v. Sterritt, 202 F.R.D. 467, 477 (N.D. Tex. 2001)). *See generally* H. NEJAT SEYHUN, INVESTMENT INTELLIGENCE FROM INSIDER TRADING (MIT Press 2000).

84 *In re DVI Inc. Sec. Litig.*, 249 F.R.D. at 212.

What if large institutions were altering their positions based on their changed views of the economic outlook? What if index funds were rebalancing their portfolios based on redemption requests? What if financial analysts were privately consulting with their clients and suggesting position changes? In all of these circumstances, in an efficient market, we might observe a significant abnormal return and no firm-specific news.

Therefore, simply based on the mechanics of estimating market models and abnormal returns, which cannot possibly adjust for all circumstances, there are imperfections such that it is likely that there will be dates where there are significant abnormal returns in the absence of identifiable firm-specific news. Conversely, there will be dates with firm-specific news and no significant abnormal returns. Overall, as we see in Table 2, there are reasons associated with imperfect market models that would explain why, in an efficient market, one might observe significant abnormal returns without disclosures, as well as why one might observe disclosures without significant abnormal returns.

To summarize the statistical results of a regression analysis or market model, a statistical measure called the R-Square statistic is calculated to measure how well the market model explains the variation in a security return series. The R-Square varies from zero (meaning that the market model explains none of the variation in the time-series of the individual security returns) to one (meaning that the market model explains all of the variation in the time-series of individual security returns). In general, most market models have low R-Square statistics,⁸⁵ explaining only 20% to 35% of the return variation.⁸⁶ This just means that most of the variation of the return to an individual security is unique to the firm and not driven by market or industry factors. For all the reasons enumerated above, as well as others discussed below it is important to have a healthy skepticism related to traditional approaches relying strictly on the empirical results of market

85 These statistics measure how well the explanatory variables (e.g., the market returns, the returns to competitors, etc.) explain the variation of the individual firm's security returns.

86 See Richard Roll, *R²*, 43 J. FIN. 541 (1988).

Even with hindsight, the ability to explain stock price changes is modest. *R*²s were calculated for the returns of large stocks as explained by systematic economic influences, by the returns on other stocks in the same industry, and by public firm-specific news events. The average *R*² is only about .35 with monthly data and .20 with daily data.

Id. at 541.

models to answer questions of market efficiency related to an individual security.

Obvervation on a Date	No Disclosure	Disclosure
No Statistically Significant Abnormal Return	Efficient Market	*Disclosure is Anticipated *Information Not Immediately Digested *Imperfect Market Model *Incorrect Specification of Response Speed *Flawed Pricing Model For Security at Issue *Inefficient Market (?)
Statistically Significant Abnormal Return	*Information is Anticipated *Insider Trading *Portfolio Rebalancing *Imperfect Market Model *Incorrect Specification of Response Speed *Flawed Pricing Model For Security at Issue *Inefficient Market (?)	Efficient Market

Table 2

D. Interpreting and Assessing the Relevance and Materiality of a Disclosure or the Lack Thereof

In addition to the problems in establishing accurate market expectations and the imperfections in the market model, interpreting and assessing the relevance and materiality of a particular disclosure may be difficult. Prices will generally react to unanticipated material news and events. As was demonstrated above in the hypothetical examples related to dividends and missed earnings announcements, because separating anticipated and unanticipated information in disclosures may be difficult, if not impossible, what may be considered a material disclosure may not be associated with abnormal returns since the information is already anticipated by market participants. Additionally, the information content in a disclosure is often confounded and/or compounded, making it difficult to predict *ex ante* (and even *ex post*) the expected price reaction.

If there is limited price data prior to the class period, an intervention analysis might be used and the statistical relations are estimated in-sample,

during the class period.⁸⁷ Because the statistical test for a significant return might be fixed at a 5% level, by construction only 5% of the days will have abnormal returns.⁸⁸ This, in combination with the general observation that corporations issue press releases or other disclosures on more than 5% of the days, means that there will be dates with disclosures and no significant abnormal return. Thus, for example, if there are 1,000 days in a class period, when using a 5% significance level, there will be approximately fifty dates with significant abnormal returns. If the corporation issues 150 disclosures over the period, then by design there will be many dates (in fact at least 100) with disclosures and no significant returns. Therefore, whether by statistical design, non-materiality of disclosure, or the market not being able to clearly interpret the impact of a disclosure, it is not unusual for there to be disclosures without related significant abnormal returns.

E. Differentiating *Ex Ante* How the Prices of Different Types of Securities will React in an Efficient Market

Establishing *a priori* the market expectations is especially difficult with respect to a stock market and is even more difficult when the security pricing model is more complex, such as in case of corporate bonds. For instance, a disclosure causing a positive stock price reaction does not mean bond prices will also necessarily react positively to the same disclosure. In many cases, with the same announcement, bond prices may not show any price reaction, while in other circumstances bond prices may actually decline while the stock

87 Intervention analyses are used both in academic studies to analyze market efficiency as well as in legal contexts. Intervention analysis is very similar to a traditional event study except that the parameters (*see supra* note 38) are estimated during the class period, instead of pre- or post-class period. Some authors argue that intervention analysis has some superior elements compared to a traditional event study. *See, e.g.*, David F. Larcker, Lawrence A. Gordon & George E. Pinches, *Testing for Market Efficiency: A Comparison of the Cumulative Average Residual Methodology and Intervention Analysis* 267–87, J. FIN. & QUANTITATIVE ANALYSIS (1980); George E. P. Box & George C. Tiao, *Intervention Analysis with Applications to Economic and Environmental Problems* 70–79, J. AM. STAT. ASS'N (1975); Paul Malatesta, *Measuring Abnormal Performance: The Event Parameter Approach Using Joint Generalized Least Squares* 27–38, J. FIN. & QUANTITATIVE ANALYSIS (1986); Laurentius Marais & Katherine Schipper, *Event Study Methods: Detecting and Measuring the Security Price Effects of Disclosures and Interventions*, in LITIGATION SERVICES HANDBOOK: THE ROLE OF FINANCIAL EXPERT, Cumulative Supplement (3d ed. 2003).

88 If the volatility of security returns is constant between pre-class period and in-class period, this statement is similarly valid in a statistical-expectations sense for the traditional event studies as well.

price increases. Securities may also have unique features (e.g., subordination, conversion, callability, etc.) that make them substantially different from other securities issued by the same corporation, thus leading to separate and seemingly unrelated price reactions.

For example, what is generally considered to be good news in the stock market may be neutral or even bad news in the bond market. Similarly, what is generally considered to be bad news for the stock market may again be neutral or even good news for the bond market. Moreover, for a given event, the courts have understood that bond market reaction will generally be less responsive and may depend on the content and importance of the event as well as on some characteristics of the bond, such as seniority.⁸⁹

Two examples will clarify this point. If a firm is doing well and therefore the probability that it will default on its debt obligations is negligible, good news for the stock may be neutral news for the bonds because there is no upside earnings potential for the bonds. Similarly, bad news for the stock may be neutral news for the bonds if it does not affect the probability that the firm will default on its debt obligations. Also, while the stock market would likely react positively to unexpected dividend increases, bond market prices may react positively to small dividends, while reacting negatively to large dividends.⁹⁰ Hence, every announcement may be unique (small dividends

89 *Id.* at 216.

Lead Plaintiffs have established a sufficient cause and effect relationship to support a finding that the release of new public information affected the price of the Senior Notes. This finding is strengthened by the fact that, though debt securities are typically less responsive to new public information, there exists a high level of correlation between the Senior Notes' price changes and identifiable news events. *See* Jonathan R. Macey & Geoffrey P. Miller, *Good Finance, Bad Economics: An Analysis of the Fraud-on-the-Market-Theory*, 42 Stanford L. Rev. 1059, 1085 (April 1990) ("[N]ot all corporate information will affect all securities of a given issuer in the same way. Debt securities will be more insulated from the shocks associated with bad news than will equity securities.").

Id.

90 George Handjinicolaou & Avner Kalay, *Wealth Redistributions or Changes in Firm Value: An Analysis of Returns to Bondholders and Stockholders Around Dividend Announcements*, 13 J. FIN. ECON. 35, 38–40 (1984). Also, Dhillon and Johnson find that stock prices and bond prices react in the opposite directions to dividend announcements. Stock prices increase by 0.98% while bond prices decline by 0.37% for dividend increases. For dividend decreases, stock prices decline by 2.01% while bond prices increase by 0.69%. *See* Upinder S. Dhillon & Herb Johnson, *The Effect of Dividend Changes on Stock and Bond Prices*, 49 J. FIN. 281, 286–287 (1994).

being good news and large dividends being bad news for bondholders). Further, confounding events with ambiguous offsetting effects make it even more difficult to isolate and predict *a priori* the specific effects on stock versus bond prices associated with a specific news announcement.⁹¹

The failure to adequately consider the characteristics of the security and the features of its market led to an erroneous conclusion about the fifth *Cammer* factor in the recent *AIG* matter.⁹² By failing to adjust the empirical

91 *In re HealthSouth Corp. Sec. Litig.*, 261 F.R.D. 616, 635–36 (N.D. Ala. 2009).

The price of bonds reacts differently to unexpected new information than does the price of stocks. Information that may be material to a stock price, such as the announcement of a dividend, may not be material for a bond investor whose fixed return would not be affected. In contrast, the price of bonds may be affected by general, non-company specific information, such as changes in risk-free interest rates, that would not affect stock prices. Therefore, a court examining this “most important” *Cammer* factor should not expect to see the same kind of price volatility with bonds as with stock. However, material new unexpected information concerning the creditworthiness of the issuer or the prospect of default on bond obligations would be of interest to bondholders and affect the price. Ronen Decl. I ¶ 67.

.....

The Defendants challenge these event studies with experts of their own. However, they did not perform their own studies and most of the challenges stem from the differences between how stocks and bonds respond to different information. Defendants’ experts, Christopher James for E & Y and Michael Gibbons for UBS, asserted that the bond market was not informationally efficient because, among other things, the price of bonds and stocks reacted inconsistently to the same information. Dr. Seyhun’s ninety-five-page Reply Report adequately addressed those, and other, challenges to the conclusion that the price changes reflect an efficient market.

The court declines to reject the findings of Professor Seyhun and Professor Ronen of market efficiency for the Bonds based on the Defendants’ attacks. These serious challenges relate to only one—albeit an important—factor for evaluating market efficiency. As Professor Ronen and Professor Seyhun’s studies showed, the bond ratings and bond prices reacted promptly and dramatically to the unexpected disclosures of adverse financial information and of the unraveling of the extensive fraud. These reactions, taken together with all the other strong indicia of market efficiency, demonstrate an efficient market for the HealthSouth bonds.

Id.

92 *See In re Am. Int’l Group, Inc. Sec. Litig.*, 265 F.R.D. 157, 176–80 (S.D.N.Y. 2010). *See also* Hartzmark, Schipani & Seyhun, *supra* note 5, at 712. (“Unfortunately, this analysis failed to account for the critical distinctions between the market for corporate stocks and corporate bonds. Careful application of bond pricing theory requires adjustments to a *Cammer*-type examination of turnover and the relative transaction sizes, frequency of

analysis to account for nuances of the bond market relative to the stock market, the experts appear to have misinformed the *AIG* court.⁹³ The court concluded that “on two of the four dates that he measured the change in bond prices, the 0.5% bonds did not trade at all [resulting in no significant abnormal return]; a finding that Dr. Cox opined, and the Court agrees, is not indicative of market efficiency.”⁹⁴ However, unless the disclosure had an impact on AIG’s likelihood of defaulting on its debt obligation (an analysis which neither the plaintiff nor defendant undertook), there was no reason that the 0.5% bonds should have traded or that there should have been a significant abnormal return.⁹⁵ Thus, the court was hampered in its ability to properly evaluate cause-and-effect.

Finally, some securities trade in over-the-counter markets and might trade infrequently. These search and trading costs along with other so-called frictions in the markets might alter the price reactions of these securities to disclosures. This takes us to the final issue in our examination of the relationship of the disclosures and returns.

F. Speed of Response

The specified time horizon for the “proper” speed of response of the security price to a disclosure might well determine whether a disclosure and significant abnormal return are related. For example, if there is a disclosure on day one and no contemporaneous significant price movement, one might say there is no cause-and-effect relationship between the disclosure and the price reaction if it is assumed that the information should be digested by the market participants and that the price response should be observed within a trading day. However, if on the following day, there are no intervening disclosures and there is a significant abnormal return, there would appear to be a cause-and-effect relationship between the disclosure and the price

trade, as well as analyst reporting and cause-and-effect to accommodate the salient differences between bonds and stocks. Taking into account these differences yields a conclusion contrary to that reached by the *AIG* court—namely, that the AIG Debt Securities traded in open, developed, and efficient markets. Furthermore, . . . with proper adjustments, the *Cammer* factors can and should be applied to the corporate bond market.”)

93 *See In re Am. Int’l Group*, 265 F.R.D. at 176–79, 180; *see also* Hartzmark, Schipani & Seyhun, *supra* note 5.

94 *In re Am. Int’l Group*, 265 F.R.D. at 179.

95 *See* Hartzmark, Schipani & Seyhun, *supra* note 5.

reaction with the critical issue being the identification of the proper time horizon or speed of response to measure the relationship.

The *Cammer* court appropriately left the issue of speed of response open-ended and concluded that “[a]n efficient market is one which rapidly reflects new information in price.”⁹⁶ Rapid response is not well-defined because the nature of information is heterogeneous, interpretation is subject to available information up to that point, and the methods of disseminating information are varied. In addition, different types of securities trade at different frequencies. Therefore, depending on the type of security (as discussed above), the way the information is disseminated, the source of the information, and the nature of the information, it may take milliseconds or multiple days for the market to interpret and digest the information content and for the price to fully reflect a particular firm-specific disclosure. By its nature, litigation requires *ex post* hypothesizing and analysis and, thus, one must look at the disclosures individually, define the appropriate time horizons, and then determine whether the disclosure is linked to the abnormal returns. As discussed below, courts appear to have demonstrated flexibility, depending on the circumstances, when it has interpreted “rapid.”

The *Cammer* court was also consistent with the Supreme Court in *Basic*, which expressly declined to discuss how quickly new information is incorporated into share prices in an efficient market: “[W]e do not intend conclusively to adopt any particular theory of how quickly and completely publicly available information is reflected in market price.”⁹⁷

96 *Cammer v. Bloom*, 711 F. Supp. 1264, 1276 n.17 (D.N.J. 1989), *appeal dismissed*, 993 F.2d 875 (3d Cir. 1993) (quoting 4 ALAN R. BROMBERG & LEWIS D. LOWENFELS, *SECURITIES FRAUD & COMMODITIES FRAUD* § 8.6 (McGraw-Hill 1988)).

97 *Basic Inc. v. Levinson*, 485 U.S. 224, 248 n.28 (1988). Also, see that in the *Motorola* matter, the court was also flexible, concluding that even a five-day window might be acceptable:

In any event, this court need not define the precise parameters of how an efficient market operates, or adopt any rule that defines the speed at which new information is reflected in share price. Despite the parties' sharp disagreement over whether incorporation occurs “immediately” or “somewhat later”

. . . .

The court thus concludes that Lead Plaintiff has produced sufficient evidence from which a reasonable jury could find that Defendants' disclosure of the \$1.7 billion Telsim debt, as first referenced in the March 30 Proxy and highlighted in the April 6 Bloomberg Article, contributed to the decline in Motorola share price on April 6, 2001.

In re Motorola Sec. Litig., 505 F. Supp. 2d 501, 555, 557 (N.D. Ill. 2007).

Certain experts may put forth hard and fast rules as to their acceptable speed of response even when confronted with the fact that there are different types of information, different types of securities, and different methods of dissemination. In *DVI*, the court disagreed with this fixed approach:

Defendants' contention that Lead Plaintiffs' study is unreliable because DVI's stock price sometimes took several days to incorporate new information is meritless. After reviewing the relevant exhibits, this Court found that on the vast majority of occasions the information was incorporated into the stock price on the same day. Even in the rare instances where it took slightly longer, it nevertheless adjusted within two days, a time period viewed by other courts as sufficiently indicative of a cause-and-effect relationship. *See* *Lehocky v. Tidel Techs., Inc.*, 220 F.R.D. 491, 506 (S.D. Tex. 2004).⁹⁸

This approach is also consistent with the *Xcelera.com* decision, wherein the court concluded:

In addition to a one-day window, Plaintiffs' event study lists, as a control, the effect of company-specific information over longer windows of two, three, and five days, respectively. For example, following the announcement on March 22, 2000 that Exodus would invest \$637.5 million in Mirror Image, Xcelera's stock price increased by 24% on that day. According to the event study, this information accounted for a 23% increase in price two days after the announcement, a 25% increase after three days, and a 23% increase after five days. Defendants argue that the two- and five-day (and presumably, the three-day) windows are inconsistent with the requirement that an efficient market must rapidly reflect all publicly available information. However, because Plaintiffs' event study captures the same-day reaction of Xcelera's stock price to company-specific events, Defendants' arguments concerning the multi-day windows are unavailing. *See* Jonathan R. Macey et al., *Lessons from Financial Economics: Materiality, Reliance, and Extending the Reach of Basic v. Levinson*, 77 Va. L. Rev. 1017, 1031 (1991) (stating that "financial economists often define the event period as the two-day period consisting of the announcement day and the following day"); *see also* *Lehocky v. Tidel Techs., Inc.*, 220 F.R.D. 491, 506–07 (S.D. Tex. 2004) (concluding that plaintiff's expert's event study using two-day window was "sufficient to demonstrate, for class certification purposes, that a cause and effect relationship between company-specific announcements and stock price may exist").

In re Xcelera.com Sec. Litig., 430 F.3d 503, 513 n.11 (1st Cir. 2005).

98 *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 211 (E.D. Pa. 2008), *aff'd*, 639 F.3d 623 (3d Cir. 2011).

Sometimes, information in disclosures is unclear, so it takes time and subsequent disclosures before market participants fully understand and digest the implications of an earlier disclosure. As an example, using stock prices, we can follow the market reaction to the events on September 11, 2001.⁹⁹ Prior to the events of September 11, 2001, the S&P 500 index futures started trading (in the pre-opening market) around 1101. When the first plane crashed into the World Trade Center at 8:48 A.M., over the next two minutes the S&P 500 index futures declined from 1101 to about 1095 (a loss of six points or about 0.5%). However, only four minutes after the initial event, at 8:52 A.M., the S&P 500 index futures had returned to 1101, with no reaction to the first crash into the World Trade Center.¹⁰⁰ Based on this evidence, can we say that the market participants reacted slowly or inefficiently to news of the crash of a plane? The answer is clearly no. As of 8:52 A.M., there were still many alternative explanations for the crash. Some market participants may have thought it was a random small plane that crashed or that the possible accident had no implications related to a terrorist attack. Moreover, for some time after the crash, the information may not have been fully disseminated, and many market participants may not even have heard about the crash.

At 9:03 A.M., the second plane crashed into the second tower, and the terrorism interpretation became overwhelming. As the information became clearer that it was more likely that the United States was under a multi-pronged terrorist attack, the market reaction was swift, and over the next two minutes, or by 9:05 A.M., the S&P 500 index futures declined from 1095 to below 1070 (wiping out about \$300 billion in market capitalization). At 9:15 A.M., the market was finally shut down for the week. By that time, the S&P 500 index futures were trading at 1080. The fact that market reaction was not observed until the second crash occurred does not mean that the initial market reaction was slow or inefficient. It took a second crash to make clear the implications for the first crash. On September 11, 2001, these two events were only separated by fifteen minutes.¹⁰¹

In other real-world cases, such events may be separated by days or months, or institutional market restrictions or friction might lead to a situation in which a security does not trade for some period. This does not

99 See JEREMY J. SIEGEL, *STOCKS FOR THE LONG RUN* 215–16 (McGraw Hill 2002).

100 *Id.*

101 *Id.*

mean that there is a slow price reaction. Take the same example above. After September 11, 2001, the U.S. stock markets were closed for the remainder of the week. When the markets reopened on Monday, September 17, 2001, Dow Jones Industrials fell by 685 points, or 7.13%. More importantly, Dow Jones continued to fall for the remainder of the week, closing on Friday, September 21, 2001, at 8236, down more than 1370 points, or 14%, from its close of 9606 on September 10, 2001.¹⁰² Can we say that the Dow Jones continued to react slowly, taking two weeks to respond to September 11 events? Once again, the answer is no. New information was revealed over the two-week period that clarified the size of expected economic losses.

Similarly, the court in *Dynex* found that in one particular case, a fifty-seven-day window was appropriate to examine cause-and-effect:

Dr. Ferri measured the price of the Bonds 57 days after the February 24, 2004 Moody's downgrade because insufficient data existed to measure prices the very next day. The fact, somehow overlooked by the Defendant, is that Bloomberg halted pricing between February 24 and May 11, 2004, so matrix pricing was unavailable for that period. Dr. Ferri also explained that no intervening events were of comparable magnitude to the February 24, 2004 downgrade by Moody's. . . . As a result, the matrix pricing provides the best-possible approximation of the rating downgrade's immediate effect."¹⁰³

The *Dynex* case demonstrates that when examining the speed of response, it is important to account for the type of security and data at issue. For example, when examining informational efficiency in the context of certain securities such as corporate bonds, it is also reasonable to argue that a two-day or longer window might represent a timely reaction. One simple reason for this is the fact that corporate bonds do not generally trade as frequently as common stock. There are fewer trades in a given day and, sometimes, no trades over many days. Take, for example, a corporate bond that on Monday at 11:00 A.M., trades *down* for the day and closes Monday at this lower price. Now assume that *positive* information is disclosed on Monday at 1:00 P.M. and that there is a significant positive abnormal *stock* return. However, the corporate bond trades next on Tuesday at noon, and we observe a significant

¹⁰² *Id.* at 217.

¹⁰³ *In re Dynex Capital, Inc. Sec. Litig.*, No. 05 Civ. 1897(HB), 2011 WL 781215, at *6 (S.D.N.Y. Mar. 7, 2011) (citation omitted).

positive abnormal bond return. In this case, it appears as though the bond price reacted within the same day in an *inconsistent* fashion to the disclosure, which might suggest incorrectly that the bond does not trade in an efficient market.

To the armchair observer (who does not know the exact hour of the last trade and the exact hour of the news announcement), the corporate bond price reaction appears inconsistent because the corporate bond traded on Monday, a disclosure was made on Monday, and the bond price did not react positively to the news on Monday. As explained above, this would be an incorrect inference because most economists and courts would agree that the corporate bond in this example reacted efficiently and promptly to the disclosure on the first trade immediately following the disclosure. Moreover, in this example, it would be impossible for a naïve trader to have earned arbitrage profits by trading the corporate bond in advance of the first transaction after the disclosure.¹⁰⁴ Any investor who attempted to buy the corporate bond after the positive news was announced would have had to pay the higher price on the next trade.

Suppose that in the example above, the first bond trade following the Monday 1:00 P.M. news announcement took place on the following Thursday. The same armchair observer again would erroneously conclude that while the corporate bond traded on Monday, it did not react appropriately to the disclosure. Instead, it will appear to the armchair empiricist that the corporate bond price responded slowly by Thursday to the information that arrived on Monday. Once again, this would be an incorrect inference given that no arbitrage profits were available in between the disclosure and subsequent price movement.

G. General Conclusion about the Absence of Disclosures and Significant Abnormal Returns, and about the Existence of Disclosures and No Significant Abnormal Returns

We have shown that there are no hard and fast rules based on the following factors: (a) the difficulty of establishing true market expectations, (b) imperfections in market models, (c) the inability to account for private trading activity, (d) different ways to account for the speed of response, and (e) the impact of the disclosure of the price reaction based on the type of security at issue. We have shown that in an efficient market:

¹⁰⁴ See Fama, *supra* note 66, at 1576.

- i) Even when there is a significant return, but no news, this is not evidence that the security trades in an inefficient market.¹⁰⁵
- ii) Even when there is news, but no significant return, this is not evidence that the security trades in an inefficient market.

With no hard and fast rules, it appears impossible to conclude that the security trades in an inefficient market when we observe either of the two relationships between significant abnormal returns and disclosures listed above. Below, we explain how to overcome this problem.

H. Establishing an Empirical Benchmark

Using the reverse cause-and-effect approach we showed how to look at the results of market models—the abnormal returns—and link them to disclosures. This can be done by looking at a subset of specified disclosures, such as corrective disclosures only, or all statistically significant abnormal returns. This still does not offer an approach to answer the question of how does one use empirical evidence to rebut the conclusion “that the market was inefficient because there were no identifiable news events on at least 40% of the days when [a company’s] stock price saw statistically significant movement”?¹⁰⁶ We have offered multiple reasons as to why, in an efficient market, we expect to observe fewer than 100% of the significant price movements associated with news or events. The *DVI* court looked at this statistic as suggesting something like the glass being more than half-full and concluded that “[b]ecause approximately 60% of the changes in DVI’s stock price can be linked to identifiable news events, the Court finds that this level of correlation strongly suggests a relatively efficient market. Accordingly, this factor weighs in favor of efficiency.”¹⁰⁷ What was the basis of such a conclusion?

It turns out there is academic research that assists in establishing a basic benchmark. Empirical evidence shows that in general, about one-third of statistically significant changes in the stock prices of publicly traded

105 *In re DVI Inc. Sec. Litig.*, 249 F.R.D. 196, 211 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011) (“Defendants question this event study, arguing that . . . there were a large number of days during which DVI stock experienced a significant change despite no identifiable public disclosures.”).

106 *Id.*

107 *Id.* at 212.

companies are actually associated with identifiable news or events.¹⁰⁸ The academic event study literature is fairly consistent on the level of matching of abnormal return movements with associated identifiable events or disclosures. For example, in a 2002 study of the general stock market, Professor Ray C. Fair observed that in the 4,417 trading days for the S&P 500 Index, there were 220 days with abnormal returns.¹⁰⁹ Of these days with significant returns, only sixty-nine days had identifiable events or news. Thus, only 31.4% of the days had identifiable news, while 68.6% had no identifiable event or news. Notably, Professor Fair did not conclude that the S&P 500 stocks traded in inefficient markets. However, based on their 60% benchmark, the defendants' experts in the *DVI* matter would have concluded that the S&P 500 stocks trade in inefficient markets.

The result presented by Professor Fair is consistent with other studies, including an analysis that examined return predictability following large price changes and information releases. In that study, the authors looked at all common stocks traded on the NYSE and AMEX from 1990 to 1992 and observed 23,459 stock trading days with large abnormal returns (i.e., days with large price movements for one or more stocks).¹¹⁰ After employing certain defined data filters, the final sample included 4,873 stock trading days.¹¹¹ The authors found the following:

Approximately one-third of the events had public announcements. The non-availability of public announcements for the remaining events may be due to non reporting of news related to small firms, or the large price change may have been caused by other factors such as significant changes in macroeconomic or industry-wide factors, communication between financial analysts or advisors and their clients that is not made public, or trading by agents based on private information. Finally, the large price changes could also occur through liquidity trades.¹¹²

108 *Id.* (citing an expert witness' report).

109 *See* Fair, *supra* note 55, at 714. Based on a 5% significance level, one would expect to find approximately 221 days out of a total number of 4,417 days with abnormal returns. Note that 0.05 times 4,417 equals 220.85.

110 *See* Mahesh Pritamani & Vijay Singal, *Return Predictability Following Large Price Changes and Information Releases*, J. BANKING & FIN. 631, 635 (2001). Although this appears to be a large number of events, it represents only 1.5% of the sample based on a 1.0% significance level.

111 *Id.* at 635–36.

112 *Id.* at 640.

This quote is also consistent with our discussion above as to why there are many circumstances in which there are significant abnormal returns in the absence of disclosures.

Thus, academic literature related to security returns is consistent with the conclusion that in an efficient market, approximately 33% is a reasonable percentage of matching of an abnormal return with an associated identifiable event or disclosure.¹¹³ In the *DVI* matter, there were 56 days with significant abnormal returns. The empirical results above would suggest that on average, we might expect that there would be 33%, or eighteen of the fifty-six days, where there would be matching disclosures and significant returns. In fact, on 59% of the days, there were matching disclosures and returns (i.e., thirty-three of fifty-six days where there is both an abnormal return to DVI common stock and a related event or disclosure). This percentage is almost twice as high as those cited above and would suggest that the DVI stock traded in an efficient market. However, for reasons discussed below, simply calculating the percentage is not sufficient for demonstrating that a security trades in an efficient market. As we show below, there is still more information and analysis required to support the conclusion.

V. A NOVEL STATISTICAL METHOD TO EVALUATE THE FIFTH CAMMER FACTOR

The methodology to scientifically test cause-and-effect using a reverse event study was applied in the *DVI* and *HealthSouth* matters and is described below. In the case of *DVI*, the court observed that there were thirty-three of fifty-six days when there were both abnormal net-of-market returns and identifiable events or disclosures. Conversely, in twenty-three of fifty-six days, there were abnormal net-of-market returns *without an identified* event or disclosure.¹¹⁴ Finding that 59% of the significant abnormal returns were

113 See Frank Fehle & Vladimir Zdorovtsov, *Large Price Declines, News, Liquidity, and Trading Strategies: An Intraday Analysis* 11 (Undated Working Paper) (on file with the Virginia Law and Business Review) (“For approximately 24% of our events, we were able to locate at least one news release”); Larson & Madura, *supra* note 55, at 119 (“In the sample, 46% of the losers are explained by announcements in the *WSJ*, whereas only 28% of the winners are explained by announcements in the *WSJ*.”); Savor, *supra* note 81, at 14 (“There are substantially more no-information price events than information-based ones, with the ratio of the former to the latter being close to 4:1.”).

114 Both the defendants’ and plaintiffs’ experts generally agreed on these percentages. *In re DVI Sec. Litig.*, 249 F.R.D. 196, 211 (E.D. Pa. 2008).

associated with a disclosure, the defendants' expert interpreted the evidence as supporting that DVI common stock traded in an inefficient market. As we discussed above, this conclusion is flawed for a number of reasons.

Most importantly, the defendant did not provide a benchmark through which to judge whether the observation of 59% was consistent with market efficiency or market inefficiency. Therefore, it was not clear whether the benchmark that should have been used to support a conclusion that the security traded in an efficient market was 60%, 70%, 80% or more of the days with abnormal net-of-market returns and identifiable events or disclosures.

Moreover, in any analysis that relies upon these types of percentages, it is critical to incorporate into the analysis the number of days with disclosures. The fact that there are only twenty-three of fifty-six days when there are abnormal returns without an identifiable disclosure is partially an artificial construct and cannot be used on its own to conclude that the market is inefficient. For this percentage to prove anything—efficiency or inefficiency—we must employ a scientific method to establish a lower bound number (or percentage) of observed days with abnormal returns that must have associated disclosures. This lower bound number must, at minimum, be a function of the number (or percentage) of total days in the class period with disclosures. Therefore, we incorporate into our analysis the additional information that there were 1,007 days in the class period and 194 days with disclosures. Below, we explain why this information is important and how it is used.

We start by examining the statistical properties of the cause-and-effect relationship between stock returns and disclosures when there is no link. In other words, the daily stock prices do not reflect full information and that significant abnormal returns are not associated with the disclosure of information. It then logically follows that, for this security we will observe that: (a) the security's returns are determined arbitrarily or in a random fashion, and (b) there will be no link between disclosures and significant abnormal returns, in other words, disclosures and significant returns are randomly distributed.

To test this hypothesis, we have established a novel statistical method employing a generally accepted approach called "bootstrap testing."¹¹⁵ Both

115 This "bootstrap testing" analysis is much like running any type of game of chance, or the same type of process used by state lotteries with their multi-colored balls to determine the odds of winning and the payouts. The calculations can also be completed using other statistical tests. We find this example easiest to explain and understand. *See* BRADLEY EFRON & ROBERT J. TIBSHIRANI, AN INTRODUCTION TO THE BOOTSTRAP 1 (CRC Press

the *DVI* and *HealthSouth* courts have accepted the bootstrap approach. We have created test statistics to determine if the actual observations are likely to have been generated in a random fashion. If information disclosures are not linked to abnormal returns, then we would not expect there to be a statistically significant relationship that distinguishes those days when there are or are not disclosures of information from those days when there are or are not abnormal returns. In other words, there is no cause-and-effect correlation because the distributions of abnormal returns and disclosures are both random events.

In Tables 3 and 4 we present information required to implement our statistical test. Our approach utilizes traditional statistical inference methods, as well as information about trading activity, returns, and disclosures throughout the *DVI* class period. In Table 3 we show that there were 1,007 days in the class period. We also show the number of dates when there were significant returns and disclosures, significant returns and no disclosures, insignificant returns and disclosures, and insignificant returns and no disclosures. In Table 4 we show the related percentages.

	No Disclosure	Disclosure	Total
No Statistically Significant Abnormal Return	790	161	951
Statistically Significant Abnormal Return	23	33	56
Total	813	194	1,007

Table 3: Observations on *DVI* Stock (*number of days*)

	No Disclosure	Disclosure	Total
No Statistically Significant Abnormal Return	83%	17%	100%
Statistically Significant Abnormal Return	41%	59%	100%
Total	81%	19%	100%

Table 4: Observations on *DVI* Stock (*percentage of days*)

LLC 2d ed. 1998) (1993) (“The bootstrap is a recently developed technique for making certain kinds of statistical inference.”).

Based on this information across the whole class period, we use a bootstrap method to test this alternative view of cause-and-effect. To undertake such an analysis, we generated one thousand separate 1,007 day distributions of returns with the zero mean and standard deviation of 3.15%.¹¹⁶ We then identify and define fifty-six abnormal returns for each of the one thousand distributions as observations that are significant abnormal returns.¹¹⁷

In addition to randomly generating the one thousand return distributions, we randomly generate 194 days over the 1,007 days, which are considered “disclosure days.” For each of the one thousand return distributions, we randomly allocate the 194 days with disclosures.

The reader should think of this as a game of chance where we have taken two urns and filled each of them with 1,007 maize and navy balls (these represent the 1,007 days in the Class Period). In the “Disclosure Urn” we have 194 navy balls (representing the 194 days when there is disclosure) and 813 maize balls (representing the 813 days when there is *not* any disclosure). In the “Abnormal Return Urn” we have 56 navy balls (representing the 56 days when there are significant abnormal returns) and 951 maize balls (representing the 951 days when there are insignificant abnormal returns). We then simultaneously draw a ball from each urn 1,007 times and count the number of times when navy balls are simultaneously drawn from both of the urns (representing the days when there is both an abnormal return and disclosure). After we draw all 1,007 balls from each urn and count the number of times we simultaneously pulled navy balls from the two urns, we replace all 1,007 of the balls in each urn and go through this process again, repeating it one thousand times.

Using this bootstrap method (i.e., drawing the navy and maize balls) we are able to calculate the likelihood of observing thirty-three of fifty-six days where the navy balls are pulled at the same time (representing days when there are both abnormal returns and disclosure) or a 59% rate of matching, which is the figure the defense argued in the *DVI* matter was a proof of market inefficiency.

116 These are the same mean and standard deviation of the distribution of returns for DVI common stock over the Class Period.

117 We have set 56 abnormal returns for each distribution. Therefore, we have approximately 56,000 abnormal returns in our randomly generated distributions that include one million randomly generated returns. In addition, we have not distinguished negative from positive disclosure, or negative from positive abnormal returns.

The results generated from this probabilistic model related to the DVI matter clearly demonstrate that if one puts forth the “null” hypothesis that disclosures and significant abnormal returns are unrelated, there is literally a one-in-one-thousand chance of observing thirty-three or more draws (or days) when navy balls are simultaneously drawn from each urn (i.e., less than a 0.001 chance of observing a 59% or greater rate of matching an abnormal return with a disclosure). Thus, using traditional statistical confidence levels, we can say that there is a 99.999% chance that the DVI disclosures and large price movements of the DVI stock were related and not generated by some random relationship.¹¹⁸

Alternatively, we can examine the results generated from this probabilistic model using information from the DVI matter and ask what number and percentage of days we would have expected to find matching if there was support as the defense argued for the “null” hypothesis that disclosures and significant abnormal returns were unrelated. If the process were random, we would expect to observe approximately only eleven out of 1,007 draws (days) when navy balls are simultaneously drawn from both urns (i.e., approximately 18% of the days with abnormal returns associated with an identifiable event or disclosure). These expected eleven days represent one-third of the thirty-three days we actually observed in the DVI matter.

In Tables 5 and 6 we present the information comparing the expected number and percentage of days (in parentheses) to the actual number and percentage of days for each of the four categories. What is clear is that the number and percentage of days when there is a match between a disclosure and significant abnormal return is far higher than expected if in the case of DVI disclosures and returns are randomly related. Further, as discussed above, the differences between the figures that are expected and those that are actually observed are statistically significant.

¹¹⁸ After we completed this article, a publication was brought to our attention proposing a related but less powerful test examining cause-and-effect. Instead of testing the null hypothesis that the abnormal returns were randomly generated, the authors tested whether there was a statistically significant difference between the observed proportions of abnormal returns on days with disclosures relative to days without disclosures. In the case of DVI, there is a difference. On 23 of 813 (or 2.8%) days with no disclosures the abnormal returns are significant. While on 33 of 194 (or 17.0%) days with disclosures the abnormal returns are significant. These two measures differ by statistically significant percentages and thus this measurement provides support for the robustness of the test we propose. See Paul A. Ferrillo, Frederick C. Dunbar & David Tabak, *The “Less Than” Efficient Capital Markets Hypothesis: Requiring More Proof From Plaintiffs in Fraud-on-the-Market Cases*, 78 ST. JOHN’S L. REV. 119–22 (2004).

	No Disclosure	Disclosure	Total
No Statistically Significant Abnormal Return	790 (768)	191 (183)	951
Statistically Significant Abnormal Return	33 (45)	33 (11)	56
Total	813 (813)	194 (194)	1,007

Table 5: Actual Versus Expected Observations on DVI Stock (*number of days, with the expected number in parentheses*)

	No Disclosure	Disclosure	Total
No Statistically Significant Abnormal Return	83% (81%)	17% (19%)	100%
Statistically Significant Abnormal Return	41% (81%)	59% (19%)	100%
Total	81%	19%	100%

Table 6: Actual Versus Expected Observations on DVI Stock (*percentage of days, with the expected percentage in parentheses*)

Tables 5 and 6 also make clear that most of the action in clarifying whether the fifth *Cammer* factor provides evidence supporting market efficiency comes from days with statistically significant abnormal returns. On days with no statistically significant abnormal returns, the difference between actual and expected occurrences is small. This finding provides additional justification for our reverse-event study approach.

Another way to demonstrate why an empirical approach that relies simply on observing and not rigorously testing the percentage is flawed is to ask the following question: If DVI returns were generated randomly, where there were fifty-six days with significant abnormal returns and an unknown number of days with disclosures, what is the number of days out of the 1,007 days that we would have expected to have a disclosure so that we would observe 59% (or thirty-three days) of matching an abnormal return with a disclosure? The answer: DVI would have had to disclose information on 594 days over the 1,007 days for there to be an expected level of matching of 59% or the thirty-three days of matches between an abnormal return and any type of disclosure. This is over three times the number of days with disclosures that

we actually observed.¹¹⁹ Our evidence in Tables 5 and 6 clearly demonstrates how when using the properly applied techniques, tests, and benchmarks developed in this paper, a court can evaluate whether there is empirical support for the fifth *Cammer* factor.¹²⁰

119 If we were to assume a more restrictive model whereby: a) one-half of the disclosures are negative and one-half are positive, and b) one-half of the randomly generated abnormal returns are negative and one-half are positive, the probability of observing 59% or greater of matching negative (positive) disclosure to negative (positive) return is zero—it is virtually impossible.

In this case, the maximum number of matches was 13 when we ran this simulation 1,000 times and 17 when we ran this simulation 10,000 times. This would be the case if we had two urns with green, yellow, and red balls. The Disclosure Urn would have 97 green balls (representing 97 days when there is negative disclosure), 97 red balls (representing 97 days when there is positive disclosure) and 813 maize balls (representing the 813 days when there is not any disclosure). The Abnormal Return Urn would have 28 green balls (representing 28 days when there are negative abnormal returns), 28 red balls (representing 28 days when there are positive abnormal returns) and 951 maize balls (representing the 951 days when there are normal returns). In this case, we would count the number of times we matched green balls from both urns and the number of times we matched red balls from both urns. The likelihood of simultaneously matching the green and red balls at a percentage equal to or greater than 59% is virtually zero.

120 This analysis was accepted by the District Court and was affirmed by the Appellate Court:

Here, the District Court found causal relationships between disclosures about DVI and its securities' prices. In analyzing DVI's common stock, the court examined an event study conducted by plaintiffs' expert, which found that, of the 34 days during the class period when DVI's common stock saw significant price changes, 20 of those days coincided with news releases. *See DVI*, 249 F.R.D. at 211. The court held this percentage established a sufficient causal relationship weighing in favor of market efficiency. *See id.* at 211–12. In analyzing DVI's Notes, the court referenced plaintiffs' event study that employed the Option Adjusted Spread, which subtracts the risk-free interest yield from the yield of the Notes, and found that on 17 of the 26 days (or 65% of the time) when the Notes' yield experienced a significant price change, a news disclosure also occurred within two days. *See id.* at 215–16. The court found this factor supported a finding of market efficiency for both the stock and the Notes.

On appeal, Deloitte makes two primary arguments related to cause-and-effect. First, it contests whether 60% and 65% correlations between news releases and price changes in DVI common stock and Notes, respectively, demonstrate an efficient market. The District Court credited two studies offered by plaintiffs, which found that on average “only about one-third of statistically significant changes in the stock price of publicly traded companies are actually associated with identifiable news or events.” *DVI*, 249 F.R.D. at 212. Here, the correlation was at least twice as high. The District Court's factual findings that 60% and 65% correlations between news releases and price

VI. CONCLUDING REMARKS

In this paper, we have argued that the proposition that “theoretically, in a perfectly efficient market, there should be no significant price movements without some identifiable news event,”¹²¹ is too simplistic and should be rejected. To answer this challenge, we have provided a novel and rigorous test, including widely accepted statistical inferences, to examine cause-and-effect. This approach begins with an event study and then reverses the approach, attempting to determine whether there is a link between disclosures and significant abnormal returns. Even with the difficulties in measuring accurate market expectations, the imperfections in the market model discussed above, the idiosyncratic returns for an individual security (especially a more complex security), the difficulty of observing private trading activity, and the difficulty of separating anticipated and unanticipated disclosures, we have articulated an objective method to provide empirical evidence to examine the fifth *Cammer* factor. Furthermore, this approach if used carefully to allow for the differences in the characteristics of various securities, is appropriate for any and all types of securities, whether common stock, preferred stock, corporate bonds, or complex debt securities, like structured products, such as mortgage-backed securities,¹²² credit default swaps,¹²³ and collateralized debt obligations (CDOs).¹²⁴

changes in DVI stock and Notes weigh in favor of market efficiency were not clearly erroneous.

In re DVI, Inc. Sec. Litig., 639 F.3d 623, 634–35 (3d Cir. 2011).

121 *In re* DVI Sec. Litig., 249 F.R.D. 196, 211–12 (E.D. Pa. 2008), *aff’d*, 639 F.3d 623 (3d Cir. 2011).

122 The Securities and Exchange Commission defines mortgage-backed securities as follows:

Mortgage-backed securities (MBS) are debt obligations that represent claims to the cash flows from pools of mortgage loans, most commonly on residential property. Mortgage loans are purchased from banks, mortgage companies, and other originators and then assembled into pools by a governmental, quasi-governmental, or private entity. The entity then issues securities that represent claims on the principal and interest payments made by borrowers on the loans in the pool, a process known as securitization.

U.S. SECURITIES AND EXCHANGE COMMISSION, MORTGAGE BACKED SECURITIES, *available at* <http://www.sec.gov/answers/mortgagesecurities.htm>.

Litigation related to CDOs and other more complex structured investment products securities, such as mortgage-backed securities and credit default swaps, is well underway.¹²⁵ The size of these markets is comparable to the approximately \$12 trillion market for common stock traded on the New York Stock Exchange¹²⁶ and points to the importance of properly adjusting

123 Sanjiv R. Das, Paul Hanouna & Atulya Sarin, *Fundamentals-Based Versus Market-Based Cross-Sectional Models of CDS Spreads*, FEDERAL DEPOSIT INSURANCE CORPORATION 5 (August 14, 2006), http://www.fdic.gov/bank/analytical/cfr/2006/sept/hanouna_p.pdf.

Credit Default Swaps [“CDS”] are contingent claims with payoffs that are linked to the credit risk of a given entity. . . . The buyer of the CDS receives protection from default risk in exchange for periodic payments (usually quarterly but sometimes semi-annually) until the expiration of the contract or until a predefined credit event occurs which, for our data, is default by the given entity. In the event of default, the buyer of the CDS spread receives a payoff equal to the difference between the face value and the market value of the underlying debt minus the CDS premium which has accrued between the default date and the last periodic payment date. In practice, buying a CDS contract is tantamount to buying insurance against default where the quarterly premium payments are determined from the CDS spreads.

124 *See* Securities and Exchange Act of 1934 § 3(a), 15 U.S.C. § 78c (effective July 22, 2010) (providing a definition of the term “asset-backed security”). Nomura Securities defines CDOs as follows:

A CDO is similar to a regular mutual fund that buys bonds. However, unlike a mutual fund, most of the securities sold from a CDO are themselves bonds, rather than shares. In simplest terms, a CDO is an arrangement that raises money primarily by issuing its own bonds and then invests the proceeds in a portfolio of bonds, loans, or similar assets. Payments on the portfolio are the main source of funds for repaying the CDO's own securities.

NOMURA SECURITIES INTERNATIONAL, INC., CDO'S IN PLAIN ENGLISH: A SUMMER INTERN'S LETTER HOME 1 (Sept. 13, 2004), http://www.vinodkothari.com/Nomura_cdo_plainenglish.pdf (last visited July 24, 2011).

125 *See generally In re Wells Fargo Mortgage-Backed Certificates Litig.*, No. 09-01376, 2011 WL 2644168 (N.D.Cal. July 6, 2011); *In re Wachovia Equity Sec. Litig.*, 753 F. Supp. 2d 326 (S.D.N.Y. Mar. 31, 2011); *Dodona I, LLC v. Goldman, Sachs & Co.*, No. 10-4537 (S.D.N.Y. filed July 30, 2010); *In re Morgan Stanley Mortgage Pass-Through Certificates Litig.*, No. 09-2137 (S.D.N.Y. filed Mar. 9, 2009); *Pub. Employees' Ret. Sys. of Mississippi v. Goldman Sachs Group Inc.*, No. 09-1110 (S.D.N.Y. filed Feb. 6, 2009); *Pub. Employees' Ret. Sys. of Mississippi v. Merrill Lynch & Co. Inc.*, No. 08-10841 (S.D.N.Y. filed Dec. 12, 2008); *In re Bear Stearns Mortgage Pass-Through Litig.*, No. 08-08093 (S.D.N.Y. filed Sept. 18, 2008).

126 *See* World Federation of Exchanges, 2011 WFE Market Highlights 6 (Jan. 19, 2012), <http://www.world-exchanges.org/files/file/stats%20and%20charts/2011%20WFE%20Market%20Highlights.pdf>. For example, the corporate bond market value is in excess

the fifth *Cammer* factor based on the underlying financial theory. The current activity in the class action litigation arena makes it even more important for courts to receive from litigants a thorough examination of cause-and-effect that incorporates rigorous theoretical and empirical analyses describing the economic and financial factors determining the price movements of the securities.¹²⁷ This is because with these more complex instruments, the complexity of the analysis is accentuated relative to stock and corporate bonds.¹²⁸ Furthermore, each structured product is unique and trades in a market with different institutional features.¹²⁹

Thus, it is incumbent upon the courts to appropriately adjust the tests for the fifth *Cammer* factor to account for how these markets differ from the markets for corporate stocks when determining whether to certify a class of security holders. To make their cases, it also becomes incumbent on the parties claiming that the securities trade in efficient markets to present a thorough theoretical analysis in combination with reporting, explaining, and interpreting their empirical results.

of \$7 trillion. Statistical Annex to *BIS Quarterly Review*, BANK FOR INTERNATIONAL SETTLEMENTS A121 (March 2011), available at http://www.bis.org/publ/qtrpdf/r_qa1103.pdf.

127 According to the Bank for International Settlements (BIS), the national principal of outstanding over-the-counter derivatives issued in G10 countries exceeded, as of December 2010, \$600 trillion. The market value of these derivatives is estimated to be around \$21 trillion (of which about \$7 trillion is issued in the U.S.). Both of these amounts would easily dwarf most other capital markets. See Statistical Annex to *BIS Quarterly Review*, BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 127, at A104.

128 See Hartzmark, Schipani & Seyhun, *supra* note 5.

129 For instance, it is unlikely there are analysts' reports describing the financial conditions of specific structured products.